OTWAY BASIN 3D MULTI-CLIENT MARINE SEISMIC SURVEY

Environment Plan

Prepared for:

TGS
Level 9, 220 St Georges Tce
Perth, WA
6000

SLR Ref: 640.30610.00000-R01
Version No: -v1.0
June 2023

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 11, 176 Wellington Parade
East Melbourne VIC 3002 Australia

T: +61 3 9249 9400
E: melbourne@slrconsulting.com   www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with TGS (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.30610.00000-R01-v1.0	30 June 2023	SLR Consulting Australia Pty Limited	SLR Consulting Australia Pty Limited	SLR Consulting Australia Pty Limited

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

FIGURES

CONTENTS

CONTENTS

CONTENTS

CONTENTS

APPENDICES

ABBREVIATIONS AND DEFINITIONS

3D	3-dimensional
AA	Acquisition Area
AASM	Airgun Array Source Model
ABARES	Australian Bureau of Agriculture and Resource Economics and Sciences
ACC	Antarctic Circumpolar Current
ACHRIS	VIC Aboriginal Cultural Heritage Register and Information System
ACMA	Australian Communications and Media Authority
ACS	Australian Coastal Society Ltd
ADMP	Adaptive Management Procedure
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AIS	Automated Identification System
ALAN	Artificial light at night
ALARP	As Low As Reasonably Practicable
AMIS	Australian Institute of Marine Science
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority

CONTENTS

AMSA	Australian Maritime Safety Authority
ANGAIR	Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna
Animat	Animal Movement and Exposure Modelling
APPEA	Australian Petroleum Production and Exploration Association
ARFF	Australian Recreational Fishing Foundation
ARLEA	Australian Southern Rock Lobster Exporters Association
ARPA	Automatic Radar Plotting Aids
AS/NZS ISO 31000:2018	Australian & New Zealand International Standard Risk Management – Guidelines 31000:2018
ASBTIA	Australian Southern Bluefin Tuna Industry Association
BACI	Before, After, Control, Impact
BIA	Biologically Important Areas
BMP	Blue whale adaptive management procedure
Bonn Convention	Convention on the Conservation of Migratory Species of Wild Animals
BSCZSF	Bass Strait Central Zone Scallop Fishery
BW/PBW	Blue whale/pygmy blue whale
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CFA	Commonwealth Fisheries Association
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COLREGS	International Regulations for Preventing Collisions at Sea 1972
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Client Site Representative
CTS	Commonwealth Trawl Sector
CWA	Chemical Warfare Agents
DAFF	Department of Agriculture, Fisheries and Forestry
dB	Decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DNP	Director of National Parks
DNRET	Department of Natural Resources and Environment Tasmania

CONTENTS

DoCCEEW	Department of Climate Change, Energy, the Environment and Water
DoD	Department of Defence
DoEE	Department of the Environment and Energy
DNRET	Department of Natural Resources and Environment Tasmania
EA	Onshore Environmental Advisor
EAC	East Australian Current
ECR	Environmental Compliance Register
EEZ	Exclusive Economic Zone
EMBA	Environment that May Be Affected
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EP	Environment Plan
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPBC Regulations	Environment Protection and Biodiversity Conservation Regulations 2000
EPO	Environmental Performance Outcomes
EPS	Environmental Performance Standards
ERA	Environmental Risk Assessment
ERP	Emergency Response Procedure
ESD	Ecologically Sustainable Development
ETBF	Eastern Tuna and Billfish Fishery
EZAIA	Eastern Zone Abalone Industry Association
FRDC	Fisheries Research and Development Corporation
GA	Geoscience Australia
GAB	Great Australian Bight
GHG	Greenhouse Gas
GHTS	Gillnet, Hook and Trap Sector
HF	High frequency
HFO	Heavy-Fuel-Oil
HSE-MS	Health Safety and Environmental Management System
IAGC	International Associated of Geophysical Contractors

CONTENTS

IAPP Certificate	International Air Pollution Prevention Certificate
IBRA	Interim Biogeographic Regionalisation for Australia
IFAW	International Fund for Animal Welfare
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMS	Invasive Marine Species
IOPP Certificate	International Oil Pollution Prevention Certificate
IPA	Indigenous Protected Area
irMA	Intrinsic Ranging by Modulated Acoustics
ISPP Certificate	International Sewage Pollution Prevention Certificate
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
JASMINE	JASCO's Animal Simulation Model Including Noise Exposure
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
KEF	Key Ecological Features
LF	Low frequency
London Protocol	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972
MARPOL	International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978
MARS	Australia Government Marine Sediments Database
MC	Multi-client
MCS	Maximum Credible Scenario
MDO	Marine Diesel Oil
MFA	Marine Fisheries Association Inc.
MFO	Marine Fauna Observer
MoC	Management of Change
MP	Management Procedure
MSS	Marine Seismic Survey
MSV	Maritime Safety Victoria

CONTENTS

National Plan	Australian National Plan to Combat Pollution of the Sea by Oil and other Noxious and Hazardous Substances
NEBA	Net Environmental Benefit Analysis
NES	National Environmental Significance
NIAA	National Indigenous Australians Agency
NM	Nautical Mile
NNTT	National Native Title Tribunal
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOPIMS	National Offshore Petroleum Information Management System
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NSW DoT Maritime	New South Wales Department of Transport (Maritime)
NSW NPWS	New South Wales National Parks and Wildlife Service
NSW	New South Wales
NSWALC	New South Wales Aboriginal Land Council
NSW-NPWS	New South Wales National Parks and Wildlife Service
OA	Operational Area
OCEAN	Otway Climate Emergency Action Network
OCRV	Ocean Racing Club of Victoria
ODS	Ozone Depleting Substance
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
PAM	Passive Acoustic Monitoring
PAR	Pre-Arrival Report
PBW	Pygmy blue whale
PIRSA	Department of Primary Industries and Regions
PIRSA	Department of Primary Industries and Regions, South Australia

CONTENTS

PK	Peak Sound Pressure level
PK-PK	Peak to Peak Sound Pressure Level
$PM_{2.5}$	Fine particulate matter
Policy Statement 2.1	EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales
POLREP	Pollution report
PoMC	The Port of Melbourne Corporation
PSPPS Act	Protection of the Sea (Prevention of Pollution from Ships) Act 1983
PSZ	Petroleum Safety Zones
PTS	Permanent Threshold Shift
RADAR	Radio Detection and Ranging
Ramsar Convention	The Convention on Wetlands of International Importance
R_{max}	Maximum horizontal distance
RMS SPL	Root-Mean-Square Sound Pressure Level
RMS	Root Mean Square
SA DPTI	South Australian Department of Planning, Transport and Infrastructure
SAMSCAP	South Australian Marine Spill Contingency Action Plan
SANTS	South Australian Native Title Services Ltd
SANZRLFA	South Australian Northern Zone Rock Lobster Fishermen's Association Inc.
SARDI	South Australian Research and Development Institute
SARLAC	South Australian Rock Lobster Advisory Council Inc.
SBTF	Southern Bluefin Tuna Fishery
SDS	Safety Data Sheet
SEA	Survey Environmental Advisor
SEEMP	Ship Energy Efficiency Management Plan
Seismic Vessel	Seismic Survey Vessel
SEL	Sound Exposure Level
SEL_{cum}	Cumulative Sound Exposure Level
SEMP	Victorian State Emergency Management Plan
SEMR	South East Marine Region
SEPFA	South Eastern Professional Fisherman's Association Inc.

CONTENTS

SESSF	Southern and Eastern Scalefish and Shark Fishery
SETAC	South East Tasmanian Aboriginal Corporation
SETFIA	South East Trawl Fishing Industry Association
SFAT	Scallop Fisherman's Association of Tasmania Inc.
SGSHS	Shark Gillnet and Shark Hook Sector
SHS	Scalefish Hook Sector
SIA	Seafood Industry Australia
SIMAP	Spill Impact Mitigation Assessment Programme
SIV	Seafood Industry Victoria
SLB	Schlumberger Australia Pty Limited
SO_2	Sulphur dioxide
SOLAS	International Convention of the Safety of Life at Sea
SOP	Standard Operating Procedures
SOPEP	Shipboard Oil Pollution Emergency Plan
SPF	Small Pelagic Fishery
SPFIA	Small Pelagic Fishery Industry Association
SPL	Sound Pressure Level
SRD	Self-inflating streamer recovery device
SRMP	Southern right whale additional and adaptive management procedures
SRW	Southern right whale
SSIA	Southern Shark Industry Alliance Inc.
SSJF	Southern Squid Jig Fishery
STC	Southern Tropical Convergence
STCW95	International Convention of Standards of Training, Certification and Watch Keeping for Seafarers
Support Vessel	A vessel used to assist the Seismic Vessel
TARFish	Tasmanian Association for Recreational Fishing
TAS EAP	EPA Tasmania
TAS	Tasmania
TASPlan	Tasmanian Marine Oil and Chemical Spill Contingency Plan
TEC	Threatened Ecological Community

CONTENTS

TGS VOM	TGS Vessel Operations Manager
TGS	TGS-NOPEC Geophysical Company Pty Ltd
The Appeal Decision	*Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193
The Guidance Document	NOPSEMA Guidance Document N-04750-GL2086 A900179 - Consultation in the course of preparing an environment plan
The Primary Decision	*Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority* (No 2) [2022] FCA 1121
Tourism SA	South Australian Tourism Commission
TRLFA	Tasmanian Rock Lobster Fisherman's Association
TSIC	Tasmanian Seafood Industry Council
TSV	Transport Safety Victoria
TTS	Temporary Threshold Shift
UAM	Underwater Acoustic Modelling
UNCLOS	United Nations Convention on the Law of the Sea 1982
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UTAS IMAS	University of Tasmania – Institute for Marine and Antarctic Studies
UXO	Unexploded ordnance
VFA	Victorian Fisheries Authority
VHF	Very High Frequency
VIC	Victoria
VOC	Seismic Contractor Vessel Operations Manager
VRFish	Victorian Recreational Fishing Peak Body
VRLA	Victorian Rock Lobster Association
WCPFC	Western Central Pacific Fisheries Commission
WLALC	Wagonga Local Aboriginal Land Council

1 Introduction

1.1 Overview

TGS-NOPEC Geophysical Company Pty Ltd (**TGS**) propose undertaking a three-dimensional (**3D**) multi-client (**MC**) marine seismic survey (**MSS**) in the Otway Basin, in Commonwealth waters offshore from Victoria (**VIC**), Tasmania (**TAS**) and South Australia. Hereafter, these activities will be referred to as the **Otway Basin 3D MC MSS.**

The Otway Basin 3D MC MSS provided for in this Environment Plan (**EP**) will be undertaken within the Operation Area defined in **Section 3.2.1** and will be undertaken in discrete phases depending upon future petroleum acreage releases in the region and petroleum client interest. This EP allows 3D MSS phases to be undertaken during a 5-year period, between 1 October 2023 (subject to acceptance of this EP by The National Offshore Petroleum Safety and Environmental Management Authority (**NOPSEMA**)) and 30 September 2027. A maximum of 200 days will be acquired each year, with a total maximum of 400 days for the entire survey.

This EP has been prepared to ensure the Otway Basin 3D MC MSS is planned and undertaken in accordance with TGS' Quality, Health, Safety and Environment Policy (**QHSE Policy**), which is discussed further in **Section 1.6**, along with the regulatory requirements of the Offshore Petroleum and *Greenhouse Gas Storage Act 2006* (**OPGGS Act**) and the associated *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (the **Environment Regulations**).

1.2 Purpose and Objectives

In accordance with the requirements of the Environment Regulations, the purpose of this EP is to demonstrate that the Otway Basin 3D MC MSS will be undertaken in a manner that is consistent with the principles of Ecologically Sustainable Development (**ESD**). This includes assessing the potential risks and impacts to the different receptors within the receiving environment and relevant persons/marine users that utilise the area. This assessment considers the controls measures and operational procedures proposed to be implemented in order to reduce the potential adverse environmental impacts and risks associated with the Otway Basin 3D MC MSS to As Low As Reasonably Practicable (**ALARP**) and to **Acceptable Levels**. Environmental performance standards (**EPS**) have also been developed as part of this EP to measure the performance of the controls measures and operational measures that will be implemented during the Otway Basin 3D MC MSS.

The objective of the proposed Otway Basin 3D MC MSS is to provide an 3D data coverage and improved subsurface imaging within the Deep Water Otway Basin. Historically the primary exploration focus, and success, has been on the continental shelf offshore portion of the Otway Basin. The new 3D data (which is located outboard from the continental shelf) will provide an improved understanding of the subsurface, which to-date has been limited to sparse 2D data coverage. Ultimately the new data will provide improved confidence in mapping major geological units aiding in the identification and de-risking of petroleum prospectively across the Seismic Survey area.

1.3 Scope of the Environment Plan

The scope of this EP addresses the petroleum activity—a marine seismic survey—and associated activities as described in **Section 3**.

In particular, the scope of this EP covers phases of 3D seismic data acquisition and associated line turns, run-ins, run-outs, seismic testing and support activities within the defined Operational Area (**OA**) (**Figure 1**). The timeframe of this EP is from 1 October 2023 to 30 September 2027.

The petroleum activity is defined as commencing at the point when the Seismic Vessel is within the defined OA and the source is deployed, until the Seismic Vessel has retrieved the seismic source and departed from the OA, following completion of each survey phase. The scope of this EP does not include the periods when the Seismic Vessel and support vessels are not engaged in the Otway Basin 3D MC MSS or associated activities, such as during maintenance activities outside of the OA, port calls, crew changes via helicopter/Support Vessel, or vessel mobilisation/demobilisation to/from the OA. During these periods the Seismic Vessel and Support Vessels are deemed to be operating under the Commonwealth *Navigation Act 2012* (refer to **Table 4**) not managed within this EP.

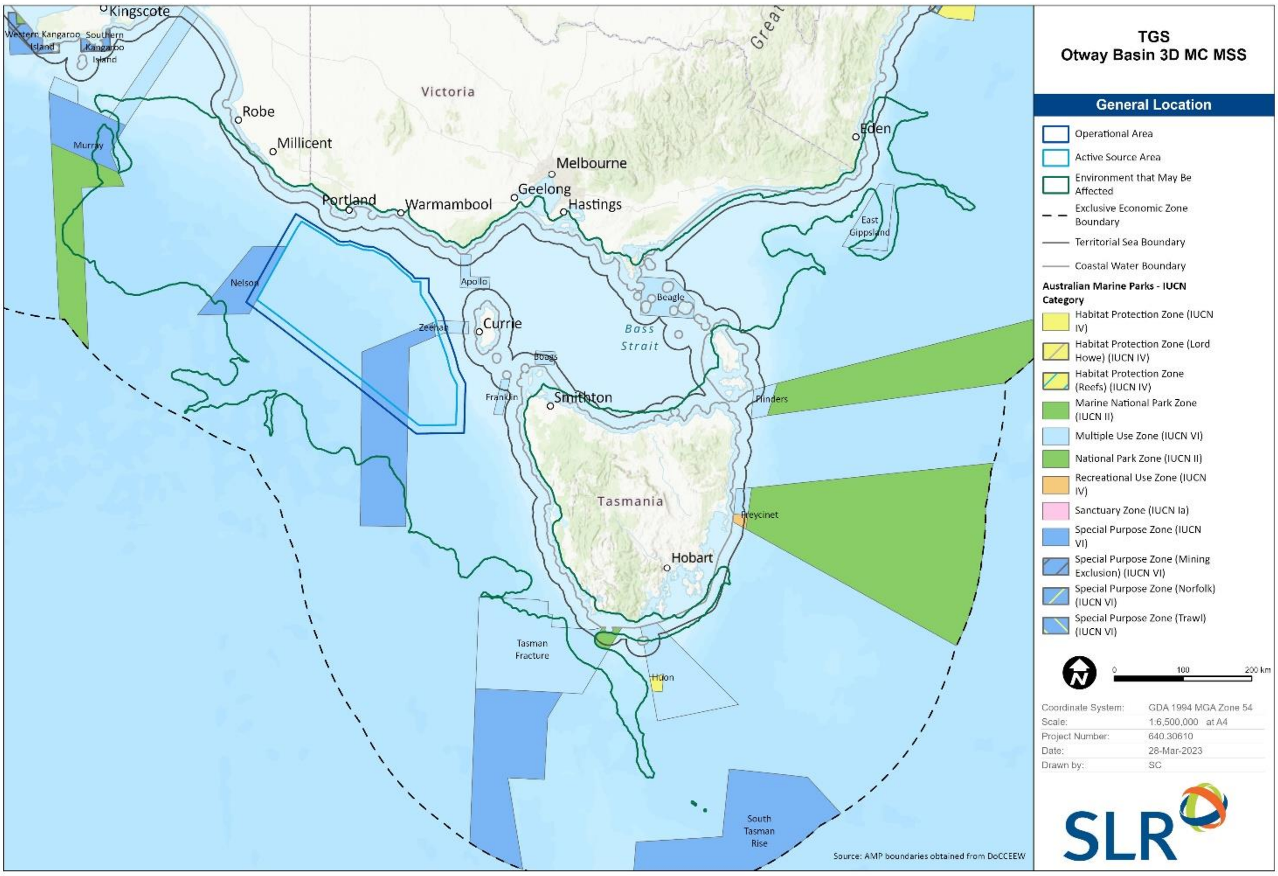


Figure 1 Location of the OA and EMBA

1.4 Environment Plan Summary

In accordance with the requirements of Regulation 11(4) within the Environment Regulations, an EP summary is provided in **Table 1**.

Table 1 EP Summary

EP summary parameter	Section
Location	**Section 3.2**
Description of the receiving environment	**Section 4**
Description of the activity	**Section 3**
Details of the environmental impacts and risks	**Section 7** (Planned); **Section 8** (Unplanned)
A summary of the control measures for the activity	Throughout **Section 7** (Planned); **Section 8** (Unplanned)
A summary of the arrangements for ongoing monitoring of the titleholder's environmental performance	Throughout **Section 7** (Planned); **Section 8** (Unplanned) and **Section 10.6.1**
A summary of the response arrangements in the OPEP	**Section 10.10**
Details of the consultation (already undertaken and proposed)	**Section 5**
Details of the titleholder's nominated liaison	**Section 1.5**

1.5 Titleholder and Nominated Liaison

TGS is the lead Titleholder for this activity. TGS is a leading energy data and intelligence company, known for its asset-light (TGS does not own towed acquisition vessels and equipment – all towed data acquisition activity is outsourced), multi-client business model and global data collection. TGS employs approximately 480 employees. TGS' primary business is to provide data and intelligence to companies and investors active in the energy sector.

In accordance with Regulation 15(1) of the Environment Regulations, details of the titleholder and nominated liaison person are detailed within **Table 2** and **Table 3**, below.

Table 2 Titleholder Details

Environment Regulation Requirements	Description
Titleholder	
Company name	TGS-NOPEC Geophysical Company Pty Ltd
Business address	Level 9, 220 St Georges Terrace, Perth WA 6000
Phone	+61 (0) 8 9480 0000
Fax	+61 (0) 8 9321 5312
Website	https://www.tgs.com/
CAN/ABN	48 077 150 424

Table 3 Nominated Liaison Person Details

Environment Regulation Requirements	Description
Contact Name	Tanya Johnstone
Company	TGS-NOPEC Geophysical Company Pty Ltd
Position	Director Australia, PNG and NZ
Business Address	Level 9, 220 St Georges Terrace, Perth WA 6000
Phone	+61 (0) 8 9480 0000
Email	Tanya.johnstone@tgs.com

As per Regulation 15(3) of the Environment Regulations, the nominated TGS Liaison Person (**Table 3**) or the TGS Project Manager (**Table 141**) will notify the National Offshore Petroleum Safety and Environmental Management Authority (**NOPSEMA**) both verbally and in writing, as soon as practicable, and prior to a change in the titleholder or the liaison person occurring. This protocol will also apply, should the contact details for either the titleholder or liaison person change.

1.6 TGS' Environment, Health and Safety Policies

As titleholder for the Otway Basin 3D MC MSS, TGS will implement this EP and undertake the petroleum activity in a manner consistent with the TGS Environment Policy (**Appendix A**).

TGS is committed to protecting the environment in which it lives and works, whilst also conducting operations in an environmentally sustainable and responsible manner. TGS strives to lead the industry in minimizing the impact of its operations on the environment and is dedicated to the continuous improvement of environmental programs and standards across all operations. The TGS corporate Environment Policy provides a public statement of the company's commitment to protecting the environment during offshore operations, including seismic surveys.

The TGS Health and Safety Policy aims to assist in providing a safe, healthy and sustainable workplace for employees, contractors, vendors and clients of TGS, while protecting the working environment. Accordingly, TGS outlines its commitment to the promotion and maintenance of the physical, psychological and social well-being of all employees.

TGS defines safe operating procedures in the Environment, Health and Safety Management System that has been designed to meet or exceed all appropriate legal requirements and, in the absence of any defined standards, to meet or exceed generally accepted best operating practices.

All levels of Management are responsible for the communication and implementation of TGS' Environment, Health and Safety Policies and Programs. Management is responsible for ensuring that employees are well equipped to meet health and safety requirements. These requirements are then reviewed on a regular basis to ensure ongoing sustainability and effectiveness.

2 Environmental Management Framework

2.1 Legislation Requirements

Petroleum and greenhouse gas storage activities, including MSSs, in 'offshore areas' – defined as those waters between the outer limit of coastal water (three nautical miles (**NM**)) and the outer limit of the Continental Shelf (at least 200 NM) – are required to be assessed and authorised under the OPGGS Act and associated Environment Regulations.

The following sections detail the requirements of the Environment Regulations, along with all applicable environmental management requirements that are relevant to the Otway Basin 3D MC MSS. **Section 2.1.1.1** provides a summary of the Environmental Regulations, in particular Regulation 13, and provides a road map to the relevant sections of this EP which describe how each requirement has been adhered to.

2.1.1 OPGGS Act

The OPGGS Act provides the regulatory framework for all offshore petroleum exploration, production and greenhouse gas activities in Australia's offshore areas. The OPGGS Act confers powers to NOPSEMA to regulate the health and safety, structural integrity and environmental management of petroleum exploration and development activities within Australia's offshore areas.

In addition to establishing the regulatory regime for environmental management authorisation, the OPGGS Act has other relevant powers, including:

- Requiring that an activity in an offshore area must be undertaken in a manner that does not interfere with navigation, fishing, conservation of the resources of the sea and seabed, any lawfully established activities of another person and the enjoyment of native title rights and interests;
- Requiring operations to be carried out in accordance with good oilfield practices;
- Requiring titleholders, in the event of an escape of petroleum, to eliminate or control the escape, clean up the escaped petroleum and remediate any resulting damage to the environment, and carry out environmental monitoring of the impact of the escape on the environment;
- Providing for NOPSEMA to give written directions to titleholders covering all aspects of petroleum exploration and production;
- Providing for remedial directions by NOPSEMA with regard to the restoration of the environment; and
- Requiring a titleholder to maintain in good condition and repair all structures and equipment that are used in connection with the operations authorised by the permit, lease, licence or authority.

The OPGGS Act is supported by regulations covering matters such as safety, diving, petroleum resource management and environmental management (see **Section 2.1.1.1**).

2.1.1.1 Environment Regulations

The Environment Regulations have been developed under the OPGGS Act and provide an objective-based regime for the management of environmental performance for Australian offshore petroleum exploration and production and greenhouse gas storage activities in areas of Commonwealth jurisdiction.

The objectives of the Environment Regulations are to ensure any activity is carried out:

- In a manner consistent with the principles of ESD (outlined further in **Section 2.1.2**);
- In a manner in which the environmental impacts and risks of the activity will be reduced to **ALARP**. To ensure the impacts and risks from the proposed activities are reduced to **ALARP**, a hierarchy of controls have been utilised which follows a tiered system which are defined within **Section 6.3**; and
- In a manner in which the impacts and risks will be of an **Acceptable Level**. The criteria used to determine whether the residual risk of an activity following the implementation of the control measures is at an **Acceptable Level** is provided within **Section 6.4**.

2.1.2 EPBC Act

The Environment Protection and Biodiversity Conservation Act 1999 (**EPBC Act**) is the Australian Government's central piece of environmental legislation which provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places as matters of National Environmental Significance (**NES**). There are nine matters of NES to which the EPBC Act applies (outlined within Sections 12 to 24 of the EPBC Act), which are:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (RAMSAR sites);
- Listed threatened species and ecological communities;
- Listed migratory species;
- Nuclear actions;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park; and
- Protection of water resources from coal seam gas development and large coal mining development.

The NES listed above are discussed in detail within **Section 4**, where relevant to the Otway Basin 3D MC MSS.

In relation to the listed threatened species and ecological communities, the EPBC Act has established a list of categories, including: extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependant. **Section 4.5** includes a description of the biological environment comprising the OA and EMBA, which includes some species that are listed as threatened. Where threatened species occur, this has been identified and further species-specific details provided.

The EP must describe matters protected under Part 3 of the EPBC Act and assess any impacts and risks to these. As outlined within **Section 2.1.1.1**, one objective of the Environment Regulations is to ensure that the activity is carried out in a manner consistent with the principles of ESD, the principles of which are set out in Section 3A of the EPBC Act as:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and
- Improved valuation, pricing and incentive mechanisms should be promoted.

The EPBC Act has been utilised throughout the development of this EP, particularly in relation to the existing environment (**Section 4**) and within the assessment of the impacts and risks from the proposed activity (**Section 7** and **Section 8**).

2.1.2.1 EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales

Under the EPBC Act, several whale species are listed as threatened and/or migratory species (see **Section 4.5.6**) and are subsequently protected under the EPBC Act as matters of NES. To manage the interaction between offshore seismic exploration and whales, the EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (**Policy Statement 2.1**) was developed, with the aim being to:

- Provide practical standards to minimise the risk of acoustic injury to whales in the vicinity of MSS operations;
- Provide a framework that minimises the risk of biological consequences from acoustic disturbance from MSS sources to whales in biologically important habitat areas or during critical behaviours; and
- Provide guidance to both proponents of MSSs and operators conducting MSSs about their legal responsibilities under the EPBC Act.

The following sections provide an outline of the applicable provisions of Policy Statement 2.1.

2.1.2.1.1 Potential Impacts to be Considered

Section 4 of Policy Statement 2.1 discusses the potential impacts to be considered when planning a MSS, which has been utilised in the preparation of this EP. An important aspect to consider when assessing the likelihood of potential impacts on whales is determining whether the MSS will have a '*low likelihood'* or a '*moderate to high likelihood*' of encountering whales. Policy Statement 2.1 defines these terms as:

- Low likelihood – spatially and/or temporally outside aggregation areas, migratory pathways and areas considered to provide biologically important habitat; and
- Moderate to high likelihood – spatially and/or temporally proximate to aggregation areas, migratory pathways and/or areas considered to provide biologically important habitat.

In addition, identifying whether a proposed survey will occur within a biologically important habitat of a whale species is necessary because displacement from these areas may have a greater impact than elsewhere. An assessment into the likelihood of encountering whale species has been undertaken and included within **Section 4.5.6**, along with the identification of any areas which are biologically important habitats for those whale species.

2.1.2.1.2 Legislative Responsibilities

There are two obligations that need to be considered under the EPBC Act when developing a MSS: referrals and permits, defined as:

- Referrals – if an MSS has, or is likely to have, a significant impact on a matter of NES or the 'environment' (including threatened and migratory species) then that action should be referred to the Australian Government Environment Minister under the EPBC Act. The Minister may then determine the referral to be either a '*controlled action*' in which the action is subject to the assessment and approval processes under the EPBC Act, or not a controlled action where further approval is not required if the action is undertaken in accordance with the referral, or in a particular way specific in the decision notice.

  As part of the development of this EP, a number of control measures have been utilised when assessing the impact of the Otway Basin 3D MC MSS (contained throughout **Section 7** for planned activities, and **Section 8** for unplanned activities). Based on these control measures, overall, it is considered that the Otway Basin 3D MC MSS activities will not have a significant impact on a matter of NES or on the 'environment' in general.

- Permits – an action that will kill, injure, take or interfere with a whale or dolphin within the Australian Whale Sanctuary (see **Section 4.4.5**) is an offence under the EPBC Act, unless the proposed action has been referred to the Environment Minister and approved, or a permit has been granted. Generally, an MSS will not interfere with whales if it is undertaken in an area and at a time where the likelihood of encountering whales is low and appropriate measures are implemented.

  As outlined above, the likelihood of encountering whales during the Seismic Survey is discussed within **Section 4.5.6** and the control measures to be implemented are contained within **Sections 7** and **8**. Based on these sections, it is considered that the Seismic Survey will not kill, injure, take or interfere with a whale or dolphin within the Australian Whale Sanctuary.

2.1.2.1.3 Management Measures for Vessels Conducting Seismic Surveys in Australian Waters

Policy Statement 2.1 provides a discussion on the management measures for vessels and organisations looking to conduct MSSs within Australian waters. These measures are divided into two primary areas; Precautionary Zones and Management Procedures, as described in the following sections.

2.1.2.1.4 Precautionary Zones

Section 6.1 of Policy Statement 2.1 defines three zones (Observation, Low-power and Shut-down) which are to be used during MSSs, based on the likely sound levels surrounding the acoustic source. There are two levels of Precautionary Zones, dependant on the sound exposure level (**SEL**) each seismic emission makes which is to be demonstrated through sound modelling or empirical measurements.

If the received SEL will not likely exceed 160 decibels (**dB**) re 1 μPa^2s for 95% of seismic shots at 1 km range, the following Precautionary Zones are recommended under Policy Statement 2.1:

- Observation Zone: 3^+ km horizontal radius from the acoustic source;
- Low-power Zone: 1 km horizontal radius from the acoustic source; and
- Shut-down Zone: 500 m horizontal radius from the acoustic source.

For all other proposed MSSs, Policy Statement 2.1 recommends the following zones:

- Observation Zone: 3^+ km horizontal radius from the acoustic source;

- Low-power Zone: 2 km horizontal radius from the acoustic source; and
- Shut-down Zone: 500 m horizontal radius from the acoustic source.

A graphical representation of the three recommended zones is indicated within **Figure 2**.

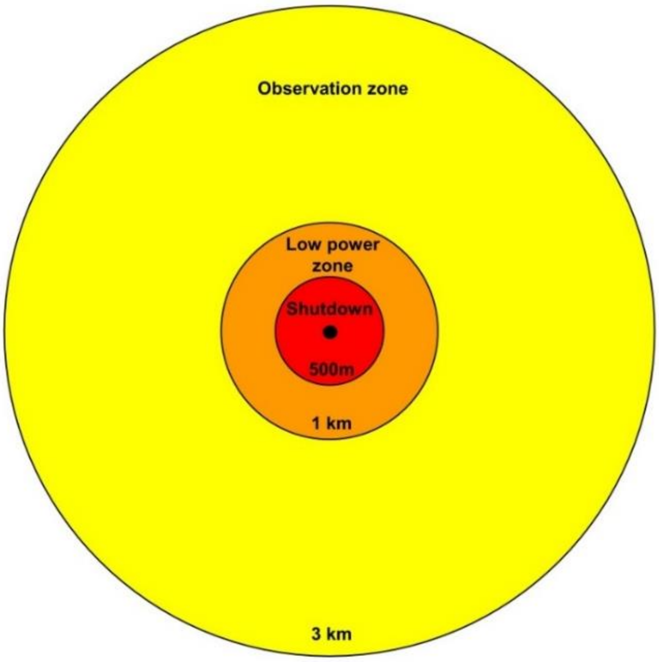


Diagram 1: Precaution zones surrounding the acoustic source for surveys that meet the criteria for a **1km low power zone**.

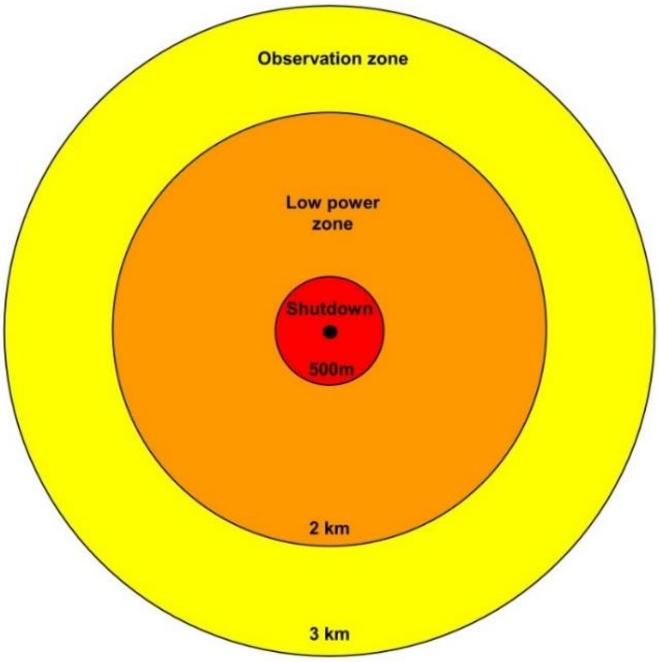


Diagram 2: Precaution zones surrounding the acoustic source for all other surveys (**2km low power zone**)

Source: EPBC Act Policy Statement 2.1 (DoEWHA, 2008)

Figure 2 Policy Statement 2.1 – Recommended Precautionary Zones

Each zone has differing requirements, as follows:

- Observation Zone – whales and their movements should be monitored to determine whether they are approaching or entering the 'Low-power Zone';
- Low-power Zone – when a whale is sighted within, or is about to enter this zone, the acoustic source should immediately be powered down to the lowest possible setting; and
- Shut-down Zone – when a whale is sighted within, or is about to enter this zone, the acoustic source must immediately be completely shut-down.

Underwater Acoustic Modelling (**UAM**) (**Appendix B**, **Section 7.2.1.2**) has been undertaken which has confirmed that the SEL exceeds the 160 dB re 1 µPa^{2}s, for 95% of seismic shots at 1 km range. Therefore, TGS will implement the more stringent Precautionary Zone requirements of the Policy Statement 2.1 (**Figure 2**). However, based on the UAM results and sensitivities in and surrounding the OA, additional management procedures will be implemented (**Section 7.2.3.3**).

2.1.2.1.5 Management Procedures

In addition to Precautionary Zones, Policy Statement 2.1 includes a number of management procedures which should be followed by all Seismic Survey Vessels (**Seismic Vessel**) conducting surveys in Australian waters irrespective of the location and time of year. Under Section 6.2 of Policy Statement 2.1, these management procedures are split into 'Standard Management Procedures' and 'Additional Management Procedures'. Standard Management Procedures include:

- Pre-survey planning – ideally, no MSS will be planned to be conducted when whales are likely to be breeding, calving, resting or feeding. If an MSS is proposed to occur during such periods, careful consideration of the survey and associated control measures will need to be undertaken;
- Trained crew – sufficiently trained crew, including people with proven experience in whale observation, distance estimation and reporting, are required to undertake relevant requirements during survey operations;
- During survey – all Seismic Vessels operating in Australian waters are required to follow basic procedures during surveys irrespective of location and time of the year, including:
  - Pre-start-up visual observations;
  - Soft-start;
  - Start-up delay;
  - Operations;
  - Power-down and stop work; and
- Compliance and sighting reports – a record of procedures employed during operations is required, including information on any whales (or other species) sighted during the MSS. This information may be useful for future operations.

When an MSS is proposed to operate in areas where the likelihood of encountering whales is moderate to high then Additional Management Procedures are required to ensure that impacts and interference are avoided and/or minimised. Suggested Additional Management Procedures under Section 6.2 of Policy Statement 2.1 include:

- Marine Fauna Observer (**MFO**) – MFOs should be trained and experienced in whale identification and behaviour, distance estimation, be capable of making accurate identifications and observations of whales in Australian waters, and can assist other observers on the Seismic Vessel;
- Night-time/poor visibility – appropriate management measures to detect (or predict) whale presence should be included to reduce the likelihood of encounters, including limiting initiation of Soft-start Procedures, or the use of a daylight spotter vessel or aircraft and pre-survey research;
- Spotter vessel(s) and aircraft – a spotter vessel/aircraft could be used to assist in detecting the presence of whales, including during night-time/poor visibility operations;
- Increase Precaution Zones and Buffer Zones – in some locations and circumstances an increased distance for the instigation of Power-down Procedures (discussed above) is advisable;
- Passive Acoustic Monitoring (**PAM**) – deployment of PAM to detect whales in real-time may provide an additional method of detecting whales during surveys, particularly during night-time/poor visibility operations; and
- Adaptive Management – Adaptive Management Procedures should be considered to manage the potential increased likelihood of encountering whales; for example, ceasing night-time operations if there are three consecutive days on which operators experience three or more whale-instigated shut-down/power down situations.

An assessment of the likelihood of encountering whales has been undertaken within **Section 4.5.6**, based on the 'presence ranking' (as assigned by the Protected Matters Database for both the OA and EMBA) which has concluded that whales are known to occur within the OA and EMBA. Therefore, Additional Management Procedures will be required. The additional procedures that will be included are discussed within **Section 7.2**.

2.1.2.2 Environment Protection and Biodiversity Conservation Regulations 2000

The Environment Protection and Biodiversity Conservation Regulations 2000 (**EPBC Regulations**) implement the provisions of the EPBC Act and provide additional measures to control a range of activities, including the use of vehicles and vessels, littering, commercial activities, research, and commercial and recreational fishing. In particular, Part 8 of these regulations relates to appropriate actions when cetaceans are in the vicinity of vessels. The relevant provisions of Part 8 have been considered when determining the impacts and risks associated with the Otway Basin 3D MC MSS (**Section 7**).

2.1.2.3 EPBC Act Management Plans

When a native species or ecological community is listed as threatened under the EPBC Act, conservation advice is developed to assist with its recovery. Conservation advice provides guidance on the immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species or ecological community.

The Minister for the Environment may make or adopt and implement recovery plans for threatened fauna, threatened flora (other than conservation dependent species) and Threatened Ecological Communities (**TEC**) listed under the EPBC Act. Recovery plans define the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or TECs. The aim of a recovery plan is to maximise the long-term survival in the wild of a threatened species or ecological community.

The Otway Basin 3D MC MSS will be conducted in a manner that is consistent with the conservation advice and recovery plans for species with the potential to be present in the OA. **Section 4.5** describes the species that are listed as threatened and/or migratory under the EPBC Act, which have been identified to occur within the Environment that May Be Affected (**EMBA**) (see **Section 4.1, Figure 7**) and identifies the relevant conservation advices and recovery plans. In addition, any relevant measures contained within the conservation advice and recovery plans have been considered as part of the assessment of impacts and risks that may occur as a result of the Otway Basin 3D MC MSS (**Section 7**).

2.1.3 Other Relevant Legislation

Regulation 13(4) of the Environment Regulations requires a description of the relevant legislative requirements that apply to the activity and are relevant to the environment management of the activity. Several legislative instruments exist which are relevant to the Otway Basin 3D MC MSS. The key pieces of Commonwealth legislation (other than the OPGGS Act and EPBC Act discussed above) that are relevant to the environmental management of the Seismic Survey are outlined within **Table 4**, along with a discussion on how each of these requirements will be achieved.

The Otway Basin 3D MC MSS is located within Commonwealth waters, and therefore falls under the Commonwealth legislation; however, in the unlikely event of a hydrocarbon spill occurring and entering State waters, State legislation would be triggered. As the risk of this unplanned event occurring is considered to be remote a full assessment of all of the State legislation has not been conducted; however, **Section 10.10** provides an overview of TGS' arrangements for a response to the unlikely event of a hydrocarbon spill, including how the relevant statutory plans will be implemented, should the spill enter State waters.

Table 4 Summary of Key Commonwealth Legislation Relevant to the Otway Basin 3D MC MSS

Legislation	Applicability
Australian Heritage Council Act 2003	The Australian Heritage Council Act established the Australian Heritage Council as an independent expert advisory body on heritage matters. The main responsibilities of the Australian Heritage Council relate to assessing places for the National Heritage List and the Commonwealth Heritage List. An assessment of the heritage values associated with the OA is outlined within **Section 4.6.2**.
Australian Maritime Safety Authority Act 1990	This Act established the Australian Maritime Safety Authority (**AMSA**), which has the responsibility of protecting the marine environment from pollution from ships, and other environment damage resulting from shipping activities. This Act facilitates international cooperation and mutual assistance in preparing and responding to major oil spill incidents and encourages countries to develop and maintain an adequate capability to deal with oil pollution emergencies. Responsibilities of AMSA include being the lead agency when responding to hydrocarbon spills within the marine environment under the National Plan for Maritime Environmental Emergencies (known as the **National Plan**). Given the Otway Basin 3D MC MSS will take place in the marine environment, there is always a remote risk of pollution or other incidents as a result of survey operations. The potential risks from an unplanned activity occurring in association with the Otway Basin 3D MC MSS is assessed within **Section 8**. This assessment also provides the measures that will be implemented throughout the survey to reduce these risks to **ALARP** and an **Acceptable Level**.
Biosecurity Act 2015 Biosecurity Regulations 2016	This Act details how biosecurity threats to plant, animal and human health in Australia and its external territories are managed. Section 4 of this Act describes the objectives as: *(a) To provide for managing the following:* *(i) Biosecurity risks;* *(ii) The risk of contagion of a listed human disease or any other infectious human disease;*

Legislation	Applicability
Biosecurity Amendment (Biofouling Management) Regulations 2021	*(iii) The risk of human diseases or any other infectious human diseases entering Australian territory or a part of Australian territory, or emerging, establishing themselves or spreading in Australian territory or a part of Australian territory;* *(iv) Risks related to ballast water;* *(v) Biosecurity emergencies and human biosecurity emergencies;* *(b) To give effect to Australia's international rights and obligations, including under the International Health Regulations, the SPS Agreement, the Ballast Water Convention, the United Nations Convention on the Law of the Sea and the Biodiversity Convention.* The Biosecurity Amendment (Biofouling Management) Regulations 2021 entered into force on 15 June 2022 and requires all vessels to provide information on biofouling management practices prior to arriving in Australia. This is achieved through the Pre-Arrival Report (**PAR**) which now also includes mandatory questions relating to biofouling management practices. Vessel operators can demonstrate proactive management of biofouling by implementing one of three accepted proactive biofouling management options or answer further pre-arrival questions to inform assessments of the biosecurity risk associated with biofouling on vessels. The administering authority for biosecurity legislation is the Department of Agriculture, Fisheries and Forestry (**DAFF**). There are a number of relevant legislative documents that have been prepared to deal with the issue of biosecurity (discussed in **Section 8.1**); all of which have been considered as part of the preparation of this EP, specifically in relation to the assessment of environmental risks associated with invasive marine species (**IMS**) (**Section 8**).
Environment Protection (Sea Dumping) Act 1981	The Environment Protection (Sea Dumping) Act 1981 is administered by the Australian Government Department of the Environment and Energy (**DoEE**) and is aimed at protecting the waters surrounding Australia's coastlines from wastes and pollution dumped at sea. In addition, this Act fulfils Australia's international obligations under the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, and 1996 Protocol (**the London Protocol**). The aim of this Act is to minimise pollution threats by: • Prohibiting ocean disposal of waste considered too harmful to be released into the marine environment; and • Regulating permitted waste disposal to ensure environmental impacts are minimised. Since the Otway Basin 3D MC MSS will involve the use of survey vessels within Australian waters, the management and operation of the vessels will be subject to this Act. Although no waste or other matter (other than routine permissible vessel discharges, see **Section 7.3**) is proposed to be discharged within Australian waters as part of this EP, there is always a remote chance of an accident occurring where such waste or equipment could be lost overboard. **Section 8.5** outlines the potential risks and associated impacts if an accidental discharge occurs, along with the measures that TGS will implement to reduce the risk to **ALARP** and within **Acceptable Levels**.
Navigation Act 2012	This act regulates international ship and seafarer safety, shipping aspects of protecting the marine environment and the actions of seafarers in Australian waters. The Act gives effect to the relevant aspects of the International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 (**MARPOL**), the United Nations Convention on the Law of the Sea 1982 (**UNCLOS**) and the International Regulations for Preventing Collisions at Sea 1972 (**COLREGS**), among other international treaties, details of which are outlined below: • MARPOL is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Annexes of MARPOL that Australia is a party to are given effect to by current legislation; • UNCLOS lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources; and

Legislation	Applicability
	• COLREGS set out the navigational rules to be followed by ships and vessels at sea to prevent collisions. These Regulations will be important in maintaining safe operating procedures to ensure collisions don't occur during the Otway Basin 3D MC MSS. In addition to the above international treaties, several Marine Orders are enacted under the Navigation Act 2012 which relate to offshore petroleum activities, including: • Marine Order Part 21: Safety and emergency arrangements; • Marine Order Part 27: Safety of navigation and radio equipment; • Marine Order Part 28: Operations standards and procedures; • Marine Order Part 30: Prevention of collisions; and • Marine Order Part 58: Safe management of vessels. The administering authority of this Act is **AMSA**. Since the Seismic Vessel proposed to be used for the Otway Basin 3D MC MSS will be operating within Australian waters, the management and operation of the vessel will be subject to this Act and associated Marine Orders. The relevant aspects of this Act and subsequent Marine Orders, along with the international treaties that provide control measures to avoid potential unplanned risks associated with this activity are discussed within **Section 8**.
Ozone Protection & Synthetic Greenhouse Gas Management Act 1989	This Act regulates the manufacture, importation and use of ozone depleting substances (**ODS**) which are typically used in fire-fighting equipment and refrigerants. The use of these substances is discussed within **Section 7.4** which stipulates that no ODS will be deliberately released.
Protection of the Sea (Civil Liability of Bunker Oil Pollution Damage) Act 2008	This Act establishes a liability and compensation regime to apply in cases of pollution damage following the escape of bunker oil from a ship that is not an oil tanker. This Act prescribes that ship owners are strictly liable for pollution damage resulting from the escape or discharge of bunker oil from their ships; resulting in the obligation on ships over 1,000 gross tonnages to carry insurance certificates when leaving/entering Australian ports. The Seismic Vessel undertaking the Otway Basin 3D MC MSS will hold the necessary insurance certificates.
Protection of the Sea (Harmful Anti-fouling Systems) Act 2006	This Act was developed as part of Australia's commitment to MARPOL and the International Convention on the Control of Harmful Anti-fouling Systems on Ships and regulates the use of anti-fouling compounds and systems in Australian waters. It is an offence to engage in negligent conduct that results in a harmful anti-fouling compound being applied to a ship. Australian ships must hold anti-fouling certificates, provided they meet certain criteria. The vessels to be used for the Otway Basin 3D MC MSS will have anti-fouling management regimes in place that are consistent with this Act.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007	MARPOL includes regulations aimed at preventing both accidental pollution and pollution from routine vessel operations. Australia implements MARPOL through the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (**PSPPS Act**) and the Navigation Act 2012 (discussed above). The PSPPS Act (and the Navigation Act), along with the following Commonwealth legislation gives effect to MARPOL: • Marine Order 91: Marine pollution prevention – oil; • Marine Order 93: Marine pollution prevention – noxious liquid substances; • Marine Order 94: Marine pollution prevention – packaged harmful substances; • Marine Order 95: Marine pollution prevention – garbage; • Marine Order 96: Marine pollution prevention – sewage; • Marine Order 97: Marine pollution prevention – air pollution; and

Legislation	Applicability
	• Marine Order 98: Marine pollution prevention – anti-fouling systems. The PSPPS Act, and the associated legislation listed above have been considered as part of the impact and risk assessment detailed within **Section 7**.
Underwater Cultural Heritage Act 2018	This Act came into effect on 1 July 2019 replacing the Historic Shipwrecks Act 1976 and continues to protect Australia's shipwrecks, sunken aircraft and other types of underwater heritage (including human remains) that have lain in territorial waters for 75 years or more. In addition to the general protection provided to underwater heritage sites, this Act also provides for areas containing protected underwater heritage to be declared a protected zone. These may be established for a number of reasons including conservation, management or public safety. Most protected zones cover an area of around 200 hectares, although there is flexibility to declare a larger zone if necessary. Underwater protected zones are described in **Section 4.6.2.**

Although the Otway Basin 3D MC MSS will be conducted within Commonwealth waters (between 3 and 200 NM from the territorial baseline), emitted sound levels may spread into State waters, and in the very unlikely event of a hydrocarbon spill occurring, spilt hydrocarbons may enter State waters, triggering State legislation. Therefore, an assessment of key State legislation is outlined within **Table 5.**

Table 5 Key State Legislation Relevant to the Otway Basin 3D MC MSS

Legislation	Applicability
Victoria	
Marine and Coastal Act 2018	Provides a simple, integrated and coordinated approach to planning and managing the marine and coastal environment. This is done by enabling the protection of the coastline and the ability to address the long-term challenges of climate change, population growth and ageing coastal structures; along with ensuring that partners work together to achieve the best outcomes for VIC's marine and coastal environment. This Act is complemented by VIC's Marine and Coastal Reforms Final Transition Plan which identifies a programme of policy reforms and on-the-ground actions to transition to the new system over the coming years.
Environment Protection Act 2017 and the Environment Protection Act 1970	The Environment Protection Act 1970, and the updated Environment Protection Act 2017, is the key VIC legislation that applies to noise emissions and the air, water and land in VIC, the territorial sea along the VIC coast and to discharges of waste to the Murray River. This Act created the Environment Protection Authority VIC which has a legislated objective to protect human health and the environment by reducing the harmful effects of pollution and waste. A number of regulations under these Acts regulate the management arrangements for ballast water. The ship masters of the survey vessels will abide by all requirements in relation to ballast water management, which is discussed within **Section 8.1** relating to the spread of invasive marine species.
Heritage Act 2017	The Heritage Act is administered by Heritage VIC and is the key cultural heritage legislation. It identifies and protects heritage places and objects that are of significance to VIC, including shipwrecks and artefacts. All shipwrecks and shipwreck relics in VIC waters that are at least 75 years old are protected by the establishment of protected zones and the prohibition of certain activities in relation to historic shipwrecks. **Section 4.6.2** provides an assessment of the maritime heritage.

Legislation	Applicability
Emergency Management Act 2013	The Emergency Management Act 2013 established Emergency Management VIC and operates concurrently with the Emergency Management Act 1986 which will ultimately be repealed. This Act established the State Crisis and Resilience Council which is responsible for providing emergency management policy and strategy advice to the VIC Government; along with the Inspector-General for Emergency Management whose functions include developing and maintaining a monitoring and assurance framework along with the State Emergency Response Plan and the State Emergency Recovery Plan.
Marine Safety Act 2010	The Marine Safety Act and its associated Marine Safety Regulations provide for safe marine operations in VIC. The Act and Regulations set out a range of requirements including safety duties for persons and parties responsible for marine safety. This Act reflects the requirements of various international conventions which will be met during the Otway Basin 3D MC MSS.
Flora and Fauna Guarantee Act 1988	The Flora and Fauna Guarantee Act is the key piece of legislation in VIC in terms of the conservation of threatened species and communities and for the management of potentially threatening processes. Its aim is to conserve all of VIC's native plants and animals by establishing a range of mechanisms, including (among others) listing threatened species, communities and threats to native species.
Pollution of Waters by Oil and Noxious Substances Act 1986	The purpose of this Act is to protect the sea and other waters from pollution by oil and noxious substances and implements the International Convention for the Prevention of Pollution from Ships 1973. The potential impacts from routine permissible waste discharges is assessed within **Section 7.3**.
National Parks Act 1975	The National Parks Act, along with the National Parks Regulations 2013 provide for the preservation and protection of the natural and cultural heritage values of the parks, including marine national parks and coastal parks. An assessment of the marine protected and sensitive areas in the coastal environment is described within **Section 4.4**.
South Australia	
Marine Parks Act 2007	The Marine Parks Act has the aim of protecting and conserving marine biodiversity and habitats by providing for the establishment and management of marine parks in South Australian waters. The Regulations under this Act prohibit certain activities within the certain marine park zones, with exemptions for some activities, such as for persons acting in the course of an emergency. An assessment of the marine protected and sensitive areas in the coastal environment is described within **Section 4.4**.
Emergency Management Act 2004	The Emergency Management Act establishes a framework for the management of emergencies in South Australia and provides for the establishment of among others, the State Emergency Management Plan which comprises strategies for the prevention of emergencies in the State. This Act has been taken into account in the development of this EP.
Protection of Marine Waters (Prevention of Pollution by Ships) Act 1987	This Act provides for the protection of the sea and State waters from pollution by ships from oil and noxious substances. This Act provides penalties for discharges of oil or of an oily mixture if it occurs within State waters, unless it is exempt for a variety of reasons outlined n Part 2 of the Act. The survey vessels to be used during the Otway Basin 3D MC MSS will meet the requirements of this Act when transiting into State waters.
Coast Protection Act 1972	The Coast Protection Act provides for the conservation and protection of the beaches and coast of South Australia. A Coast Protection Board was formed in 2017 with the proclamation of the Act with, among other things, the protection of the coast from pollution and misuse. Any potential impacts from the Otway Basin 3D MC MSS would be in relation to the unlikely event of a hydrocarbon spill which is assessed within **Section 8.3**.

Legislation	Applicability
National Parks and Wildlife Act 1972	The National Parks and Wildlife Act is the principal legislation in South Australia in respect to the establishment and management of protected areas. Potential impacts on the area inshore of the OA would be in relation to the unlikely event of a hydrocarbon spill which is assessed within **Section 8.3**.
Tasmania	
Pollution of Waters by Oil and Noxious Substances Act 1987	This Act deals specifically with discharges of oil and other pollutants from ships and gives effect in TAS to the International Convention for the Prevention of Pollution from Ships 1973. The potential impacts from routine permissible waste discharges is assessed within **Section 7.3**
Environmental Management and Pollution Control Act 1994	This Act is the primary environment protection and pollution control legislation in TAS with the fundamental basis being the prevention, reduction, and remediation of environmental harm. The potential impacts from routine permissible waste discharges is assessed within **Section 7.3**.
Emergency Management Act 2006	The Emergency Management Act outlines the prevention, preparedness, and response and recovery procedures in order to protect life, property and the environment in a declared State emergency. The potential risks of an emergency occurring during the Otway Basin 3D MC MSS is discussed within **Section 8.3**.

2.2 Relevant Guidelines, Standards and Codes

Australian Ballast Water Management Requirements (Version 8)

These requirements include legislative obligations under the Biosecurity Act 2015, and the International Convention for the Control and Management of Ships' Ballast Water and Sediments regarding the management of ballast water and ballast tank sediment when operating within Australian waters. These requirements, along with the Biosecurity Act (discussed in **Table 4**), have been provided for in relation to the assessment of environmental risks associated with invasive marine species (**Section 8**).

Australian Biofouling Management Requirements (Version 1)

These requirements outline the obligations placed on vessel operators for the management of biofouling when operating vessels under biosecurity control within Australian territorial seas. Under these requirements, all vessel operators intending to enter Australian territorial waters must provide information relating to biofouling management through the mandatory PAR. Information provided by vessel operators in the PAR process may be inspected to verify its accuracy and/or an inspections of vessels' submerged hull and niche areas may be conducted. These requirements have been provided for in relation to the assessment of environmental risks associated with IMS (**Section 8.1**).

Code of Environmental Practice 2008 – Australian Petroleum Production and Exploration Association (APPEA)

This Code provides guidance on ensuring that exploration and production operations are conducted using effective management in order to be sustainable within the Australian environment. This includes the need to avoid or minimise and manage impacts to the environment, focusing on four basic recommendations:

1. Assess the risk to, and impacts on, the environment as an integral part of the planning process;
2. Reduce the impact of operations on the environment, public health and safety to **ALARP** and to an **Acceptable Level** by using the best available technology and management practises;
3. Consult with relevant persons regarding industry activities; and

4. Develop and maintain a corporate culture of environmental awareness and commitment that supports the necessary management practices and technology, and their continuous improvement.

These recommendations, which effectively mirror the requirements within the Environment Regulations, have been considered when assessing the potential impacts and risks from the Seismic Survey during the development of this EP (**Sections 7** and **8**).

Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (known as the **Bonn Convention**) provides a global platform for the conservation and sustainable use of migratory animals and their habitats. The Bonn Convention was entered into force in 1983, with Australia being a party since September 1991. The Bonn Convention includes obligations for parties to it, including:

- Acknowledging the importance of conserving migratory species;
- Promote, cooperate and support research relating to migratory species;
- For endangered species, endeavour to take measures to conserve the species and its habitat, prevent the adverse effects of activities that impede or prevent migration, prevent or minimise factors that endanger the species where possible, and make the taking of the species prohibited (subject to limited exceptions); and
- For species that are defined as having an 'unfavourable conservation status', endeavour to conclude agreements which would benefit and prioritise those species (Parliament of Australia, 2018).

The species of relevance from the Bonn Convention and the associated obligations are addressed under the EPBC Act. An assessment of those migratory species relevant to the Otway Basin 3D MC MSS are outlined throughout **Section 4.5**.

Convention on Oil Pollution Preparedness, Response and Cooperation 1990

Parties to the International Convention on Oil Pollution Preparedness, Response and Co-operation (**OPRC**) are required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries. The OPRC comprises national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, seaports, and oil handling facilities. The convention recognises that in the event of a pollution incident, prompt and effective action is essential.

The OPRC requires ships to carry a Shipboard Oil Pollution Emergency Plan (**SOPEP**). In addition, operators of offshore units under the jurisdiction of the parties to the OPRC are required to have an Oil Pollution Emergency Plan (**OPEP**), or similar arrangements which must be co-ordinated with national systems for responding promptly and effectively to oil pollution incidents. The vessel contracted to undertake the Otway Basin 3D MC MSS will have a SOPEP in place; and in the unlikely event of a spill occurs from a vessel collision/sinking, TGS will implement the response strategy in accordance with the SOPEP (see **Sections 8.3** and **8.4**).

Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971

Commonly known as the **Ramsar Convention** (on account of it being signed in the Iranian town of Ramsar), the Ramsar Convention's board aims are to halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain. This has broadened over time to cover all aspects of wetland conservation and wise use (broadly defined as maintaining the ecological character of a wetland), recognising that wetland ecosystems are important for both biodiversity conservation and the well-being of human communities (DoEE, 2018a).

All wetlands listed under the Ramsar Convention as recognised as matters of NES under the EPBC Act, requiring approvals for actions that will have or are likely to have significant impacts on the ecological character of a Ramsar listed wetland. An assessment of the wetlands in or near the EMBA is outlined within **Section 4.4.6**, with any potential impacts and risks from the Otway Basin 3D MC MSS being assessed throughout **Sections 7** and **8**.

International Association of Geophysical Contractors (IAGC) Environment Manual for Worldwide Geophysical Operations 2013

Provides the industry with information for conducting geophysical field operations in an environmentally sensitive manner.

IAGC Mitigations Measures for Cetaceans during Geophysical Operations 2015

Provides recommended mitigation measures for cetaceans during geophysical operations. IAGC recommends implementing the suggested controls (mentioned in the document) in the absence of regulations or guidelines.

International Association of Oil and Gas Producers (IOGP) Recommended Monitoring and Mitigation Measures for Cetaceans during Marine Seismic Survey Geophysical Operations 2017

Provides recommendations on applying mitigation measures for cetaceans during geophysical operations. The measures outlined in this report are recommended for use during all marine seismic surveys that use compressed air source arrays, and are only intended for cetaceans (whales, dolphins, and porpoises).

International Convention for the Regulation of Whaling

The International Convention for the Regulation of Whaling is the International Whaling Commission's founding document and was signed in 1946. Obligations under this convention include the complete protection of certain species, and the establishment of whale sanctuaries. All Commonwealth waters of Australia are assigned as the Australian Whale Sanctuary (**Section 4.4.5**).

International Maritime Organisation (IMO) Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species (Biofouling Guidelines) 2011

Provides a globally consistent approach to the management of biofouling. The approach was adopted by the Marine Environment Protection Committee in July 2011.

International Standards of Training, Certification and Watch-keeping for Seafarers, 1978

The International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (**STCW Convention**), 1978, sets the mandatory minimum standards of training, certification and watch-keeping for masters, officers and watch personnel on seagoing merchant ships registered under the flag of a country party to the convention. As the survey vessels proposed to be used for the Otway Basin 3D MC MSS will be operating within Australian waters, the masters, officers, and watch personnel of the vessels will be subject to this convention. Aspects of the survey vessel operations that relate to this convention are discussed within **Sections 7** and **8**.

National Biofouling Management Guidance for the Petroleum Production and Exploration Industry 2009

This guidance document aims to provide assistance in regard to minimising the amount of biofouling accumulating on vessels, infrastructure and submersible equipment, and thereby minimising the risk of spreading marine pests around the Australian coastline. This guidance document has been utilised in determining the **Acceptable Levels** of risks associated with the Seismic Survey, and the environmental performance outcomes (**EPO**) and EPSs (**Section 8**).

National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds, and Migratory Shorebirds 2020

In January 2020, the Department of Agriculture, Water and the Environment released the '*Draft National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds*'. The aim of this Guideline is to manage artificial light so that wildlife is not disrupted, nor displaced from important habitat and is able to undertake critical behaviours such as foraging, reproduction and dispersal.

It is noted that the Guidelines are in draft form and are yet to be finalised for implementation.

United Nations Convention on Biological Diversity

Australia is a party to the United Nations Convention on Biological Diversity. This Convention has three main objectives: the conservation of biological diversity, the sustainable use of components of biological diversity, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources (CBD, 2018).

This Convention covers a range of topics and requirements which are subsequently implemented in Australia via different means, including Australia's Biodiversity Conservation Strategy 2010-2030 which is the guiding framework for the conservation of Australia's national biodiversity to 2030. An assessment of the biological environment is outlined within **Section 4.5**, with any potential impacts and risks from the Seismic Survey being assessed throughout **Sections 7** and **8**.

United Nations Declaration on the Rights of Indigenous Peoples

The United Nations Declaration on the Rights of Indigenous Peoples was adopted by the General Assembly on 13 September 2007, with the Australian Government announcing its support on 3 April 2009. This Declaration establishes a universal framework of minimum standards for the survival, dignity, and well-being of the indigenous peoples of the world and elaborates on the human rights standards and fundamental freedoms as they apply to the specific situation of indigenous peoples (United Nations, 2018). **Section 4.6.1** provides an assessment of the aboriginal heritage associated with the OA to provide an understanding of potential impacts on that heritage from the Otway Basin 3D MC MSS.

2.3 Relevant NOPSEMA Guidance Documents

Various NOPSEMA guidance documents have been utilised through the development of this EP to ensure that it meets all the requirements of the Environment Regulations and the expectations of NOPSEMA. These documents include:

- Guidance Notes:
  - ALARP (N-04300-GN0166 A138249, August 2022);
  - Environment plan content requirements (N-04750-GN1344 A339814, December 2022);
  - Responding to Public Comment on Environment Plans (N-04750-GN1847 A662607, July 2022);
  - Petroleum Activities and Australian Marine Parks (N-04750-GN 1785 A620236, June 2023);
  - Oil Pollution Risk Management (N-04750-GN1488 A382148, July 2021);
  - Notification and Reporting of Environmental Incidents (N-03000-GN0926 A710941, June 2020);
  - Control measures and performance standards (N-04300-GN0271 A336398, June 2020);
- Guidelines:
  - Consultation in the Course of Preparing an Environment Plan (N-04750-GL2086 A900179, May 2023);
  - Making Submissions to NOPSEMA (N-04000-GL0225, A15266, July 2022);
  - Environment Plan Decision Making (N-04750-GL1721, A524696, December 2022);
- Policy:
  - Environment Plan Assessment (N-04750-PL1347, A662608. December 2022);
  - Financial Assurance for Petroleum Titles (N-04730-PL1780, May 2020)
- Forms:
  - Environment Plan Summary Statement (N-04750-FM1848, A662605, September 2020);
  - Titleholder Report on Public Comment (N-04750-FM1896, A662604, September 2020);
- Environment Bulletins:
  - Oil spill modelling (A652993, April 2019).
- Information Papers:
  - Operational and Scientific Monitoring Programs (N-04700-IP1349, A343826, October 2020);
  - Acoustic Impact Evaluation and Management (N-04750-IP1765, A625748, February 2022); and
  - Reducing marine pest biosecurity risks through good practice biofouling management (N-04750-IP15054)

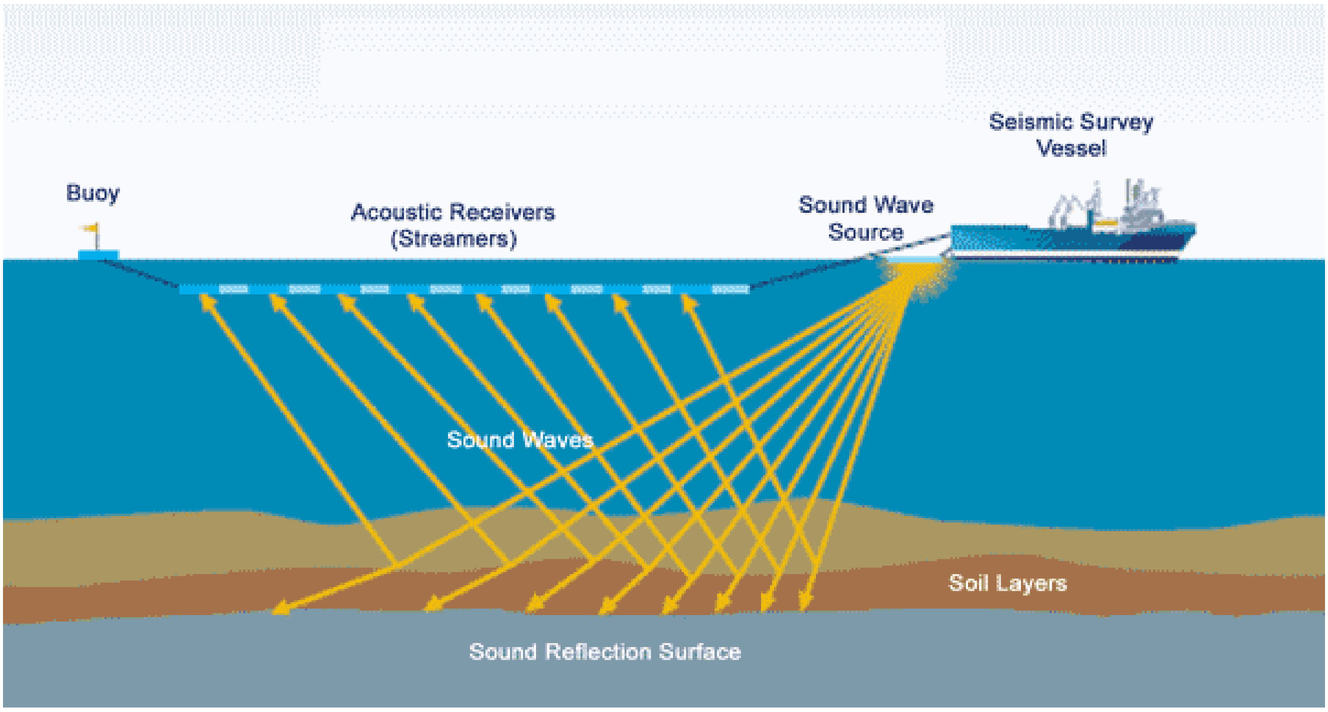
3 Project Description

3.1 Survey Overview

TGS is proposing to carry out the Otway Basin 3D MC MSS to collect high-quality geophysical data regarding rock formations and structures beneath the seabed in the Otway Basin.

During the survey, a Seismic Vessel will tow an acoustic source array and a series of streamers within the OA, as defined in **Section 3.2.1**. MSSs use data acquired through the use of a controlled acoustic source mechanically generating a sound wave that is transmitted downwards towards and into the seabed. The sound wave source uses compressed air to create a pulse of acoustic energy. The pulse of acoustic energy travels through the water column and into the seabed where energy is reflected at different speeds and intensities depending on the sediment type and/or density of the various sedimentary layers. The reflected acoustic signals are detected by an array of sensitive hydrophones located in each streamer, which are towed behind the Seismic Vessel (**Figure 3**). These sound signals are then analysed and processed into visual images of the subsurface structure of the seabed using powerful on-board computers and software.

The Seismic Vessel will be assisted by support vessels.



Source: www.fishsafe.eu

Figure 3 Schematic of an MSS

A summary of the general survey programme is provided in **Table 6**. Specific details of the Otway Basin 3D MC MSS are further described throughout **Sections 3.2** - **3.5**.

Table 6 Summary of General Parameters of the Otway Basin 3D MC MSS

General Programme Parameter	Description
Location	Otway Basin
Operational Area	55,000 km^2
Acquisition Area	45,000 km^2
Water Depths in Acquisition Area	115 m to 5,000 m*
Timing	Q4 2023/Q1 2024 commencement
Planned Survey Duration	Maximum of 200 days per year with a total of 400 days.

*A single 2D tie line will enter shallower waters of approximately 115 m, however, all 3D sail lines are within water depths greater than 500 m.

3.2 Survey Location

The OA for the Otway Basin 3D MC MSS is in Commonwealth waters in the Otway Basin, offshore from south-eastern Australia. Survey activities associated with the Otway Basin 3D MC MSS will be undertaken within the OA. The Acquisition Area (**AA**), as defined within **Section 3.2.1** and **Section 3.2.2** and depicted in Figure 4 is inside of the OA and is where the seismic data will be acquired. A third area, the EMBA has also been defined regarding an unplanned oil spill and is discussed further in **Section 4.1**. It is important to note that the AA is also referred to, and shown, as the Active Source Area on some of the figures within this EP.

3.2.1 Operational Area

The OA is the broadest area and represents the area where all activities managed under the EP will take place. It includes both the AA and a surrounding buffer that could be used for operational purposes (see **Figure 4**). The coordinates of the OA are provided in **Table 7**. Water depths within the OA range from approximately 97 m to 5,000 m.

The OA is located approximately 38 km from the mainland at the closest point. Other key coastal locations of relevance to the OA include:

- Portland, VIC: 45 km north of the OA;
- Warrnambool, VIC: 61 km north-northeast of the OA;
- Arthur River, TAS: 85 km east of the OA;
- King Island, TAS: 39 km east of the OA; and
- Port MacDonnell, SA: 39 km north of the OA.

Activities that will take place within the OA include streamer deployment and retrieval, seismic acquisition, maintenance, recovery, bubble tests, refuelling, vessel manoeuvring and soft-starts (see **Section 3.5.3**). Activation of the acoustic source at full power for data acquisition will be restricted to the AA. The acoustic source will not be operated at full power outside of the AA; however, bubble tests will take place outside of the AA but will be within the OA. Once the Seismic Vessel is outside of the OA, the acoustic source will be stowed onboard the vessel; however, streamers may still be deployed for example if the vessel is having to seek shelter.

Table 7 Coordinates of the OA

ID	Latitude and Longitude (WGS 84 decimal degrees)		Grid-reference (1994 MGA 54)	
	Latitude	Longitude	Easting	Northing
1	-38.406605	140.725421	476025.82	5749032.54
2	-38.671650	141.279092	524277.81	5719621.31
3	-38.761808	141.440820	538298.54	5709561.57
4	-38.775608	141.517712	544970.41	5707995.23
5	-38.762349	141.635584	555219.64	5709402.02
6	-38.830679	141.876753	576100.27	5701646.30
7	-38.834848	142.022964	588786.25	5701051.72
8	-38.931997	142.292001	611985.09	5689974.77
9	-39.108023	142.543156	633423.93	5670100.88
10	-39.150801	142.613620	639432.32	5665247.37
11	-39.198960	142.693137	646203.98	5659777.25
12	-39.236942	142.725370	648907.23	5655509.30
13	-39.236492	142.965712	669652.53	5655136.45
14	-39.412423	142.971704	669743.72	5635598.57
15	-39.519170	143.062390	677280.34	5623575.71
16	-39.722138	143.222582	690493.97	5600718.69
17	-39.967839	143.309037	697200.03	5573257.63
18	-40.267082	143.455819	708819.07	5539703.61
19	-40.428461	143.514435	713294.40	5521648.39
20	-40.604019	143.638592	723244.05	5501850.79
21	-41.252683	143.640877	721261.25	5429827.06
22	-41.278857	142.808561	651462.66	5428707.60
23	-39.849259	140.372712	446336.58	5588783.61
24	-39.560006	139.877536	403573.00	5620472.91

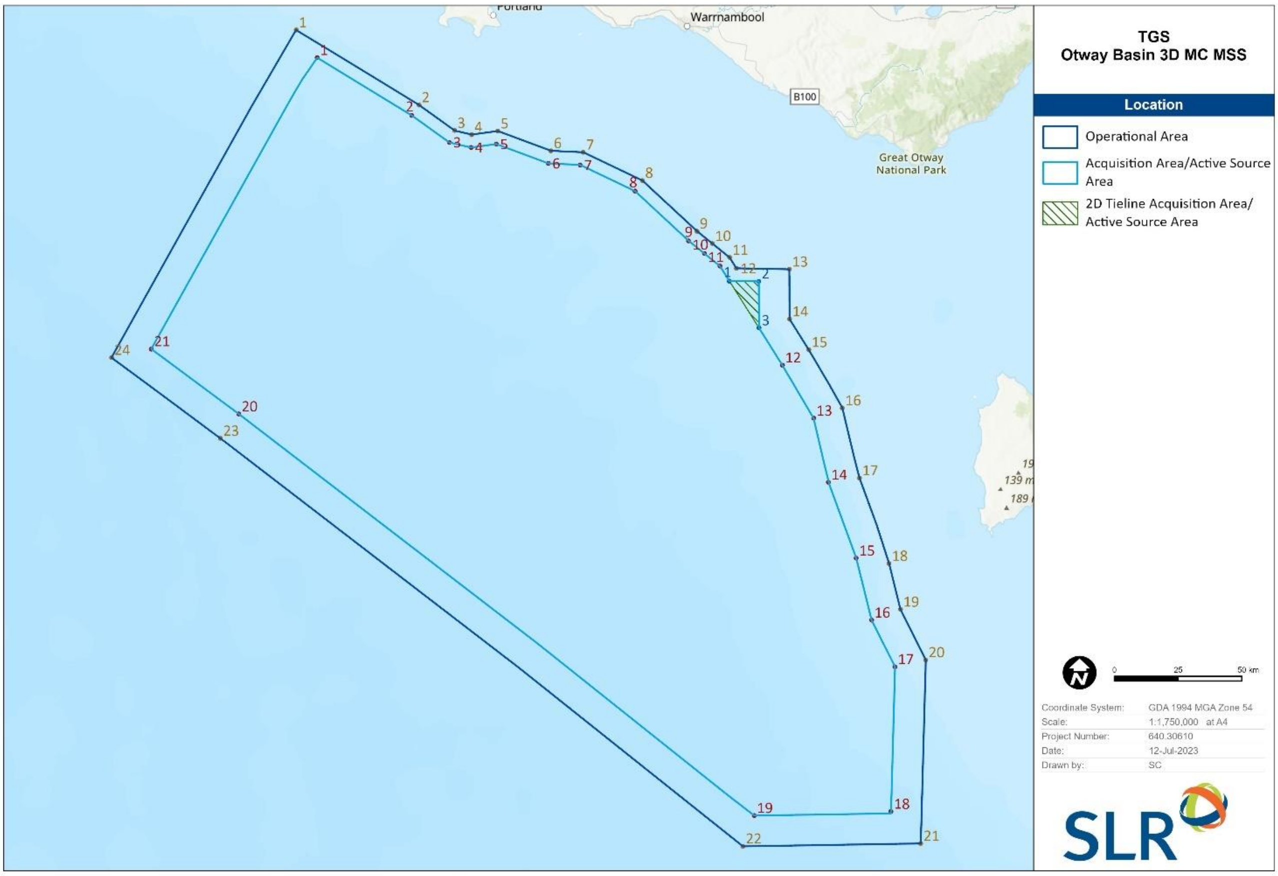


Figure 4 Location of the OA and AA

3.2.2 Acquisition Area

The AA[1] is located within the OA (see **Figure 4**) and includes areas where prospective clients may be interested in acquiring seismic data and the acoustic source will be active. This area covers approximately 45,000 km^2. Water depths within the AA range from approximately 115 m to 5,000 m; however, with the exception of the 2D tie line AA (the tie line area is defined within **Figure 4**), most of the water depths across the AA are deeper than 510 m. Soft-start procedures (**Section 3.5.3**) will occur in both OA and AA. The coordinates of the AA are provided in **Table 7**.

The seismic source may be active for short durations in the OA in a controlled manner for the purpose of source maintenance and testing. These activities are infrequent and typically involve intermittent, controlled discharges of individual source elements (i.e. single gun/cluster or single source array) for short durations and a limited number of testing shots.

During 3D seismic acquisition, the Seismic Vessel traverses the AA along a series of pre-determined parallel sail lines which are acquired in a 'race-track' pattern, whereby the Seismic Vessel turns at the end of each sail line and returns in the opposite direction along a different sail line.

[1] Note that this area is generally referred to as the Acquisition Area (AA) throughout the document, however, there is also reference to the Active Source Area. These terms are used interchangeably.

The Otway Basin 3D MC MSS requires acquisition of both 3D and 2D seismic data. The 2D tie line is to 'tie-in' to existing geophysical data in the region. The 2D tie line will overlap with 3D data acquisition in the AA; however, it will also extend onto the Continental Shelf. The acquisition of the single tie line will be limited to 12 hours of acquisition within water depths less than 500 m. At the shallowest point, the 2D tie line is in a water depth of approximately 115 m.

Table 8 Coordinates of the AA

ID	Latitude and Longitude (WGS 84 decimal degrees)		Grid-reference (1994 MGA 54)	
	Latitude	Longitude	Easting	Northing
3D Active Source Area				
1	-38.504816	140.820436	484342.90	5738155.37
2	-38.708648	141.246277	521412.18	5715523.99
3	-38.803714	141.416762	536187.15	5704921.16
4	-38.821395	141.515286	544731.04	5702915.52
5	-38.808560	141.629499	554655.67	5704277.71
6	-38.875441	141.865643	575088.84	5696688.21
7	-38.879548	142.009275	587543.28	5696104.49
8	-38.970051	142.259898	609144.05	5685790.64
9	-39.142592	142.506024	630149.62	5666318.27
10	-39.186337	142.578060	636290.80	5661357.53
11	-39.229956	142.650054	642420.85	5656405.79
12	-39.576085	142.943699	666940.51	5617485.58
13	-39.761101	143.092005	679200.44	5596663.28
14	-39.985874	143.167218	685038.42	5571559.77
15	-40.251454	143.303793	695936.13	5541785.75
16	-40.468982	143.382366	701968.74	5517460.67
17	-40.631396	143.496865	711165.40	5499161.46
18	-41.143075	143.497552	709601.58	5442351.88
19	-41.169288	142.858157	655876.49	5440784.41
20	-39.763397	140.457912	453567.54	5598360.87
21	-39.531072	140.059891	419205.14	5623863.70
2D Active Source Area				
1	-39.282380	142.694529	646150.93	5650516.59
2	-39.281215	142.828097	657674.41	5650421.59
3	-39.446050	142.833394	657759.89	5632117.43

3.3 Timing and Duration

The Otway Basin 3D MC MSS may commence as early as 1 October 2023 (subject to acceptance of the EP) and will be completed by 30 September 2027.

The maximum acquisition time during any calendar year is 200 days, however, due to temporal controls for managing impacts to various environmental sensitivities, the duration is likely to be less. Based an analysis of the weather and sea state in the Otway Basin, seismic data acquisition is most likely to occur during the period from October to March in any calendar year covered by this EP. However, this EP does not prescribe a specific timing for seismic survey activities for the entire EP Area, as the precise timing of the survey is subject to NOPSEMA's acceptance of this EP, weather conditions, vessel availability and other operational considerations, as well as the seasonality of environmental and socio-economic sensitivities. The maximum number of days of the survey across the duration of the EP will be no more than 400 days.

To minimise survey duration, data acquisition will occur 24-hours and day, seven days per week. When recording the data, the Seismic Vessel traverses the Acquisition Area along a series of predetermined sail lines at a speed of approximately 4 – 5 knots (7 – 9 km/h), with up to 14 streamers being towed behind the Seismic Vessel (referred to herein as a 'swath'). Data for a pre-determined swath only needs to be acquired once unless there is a stop in data acquisition due to a marine mammal mitigation procedure or there is an overlap with a 2D tie line. Therefore, where no infill is required, the Seismic Vessel will not need to collect data in that area again.

Where relevant, temporal control measures are outlined in **Section 7** and **Section 8** to manage key environmental sensitivities relevant to the undertaking of seismic survey activities. The exact start and end dates of survey phases will be communicated to stakeholders, in accordance with the continuing stakeholder consultation process described in **Section 5**.

3.4 Defining Future Phase Areas

The Otway Basin 3D MC MSS may be acquired in multiple survey mobilisations over the five-year duration of the EP. The exact location and areas of individual survey phases depends upon the areas of interest from petroleum titleholders in the region.

Each individual phase of survey that may be completed under this EP will have a phase-specific AA defined, subject to the area(s) of interest at the time. Each phase of the survey will also have a phase-specific OA defined, where vessel turns, and other vessel operations may take place beyond the extent of the phase-specific AA will take place.

3.5 Otway Basin 3D MC MSS Specifications

The core activity that forms the basis of this EP is the undertaking of a MSS. Associated activities in support of undertaking the Otway Basin 3D MC MSS include refuelling and resupply, crew changes and use of support vessels in the OA. Associated activities are described in this section, as appropriate, with a focus on those considered relevant to the assessment of environmental impacts and risks.

Key details of the Otway Basin 3D MC MSS relevant to the purpose and objectives of this EP are summarised in **Table 9**.

Table 9 Key Details of the Otway Basin 3D MC MSS

Parameter	Details
Seismic Activity:	
Survey earliest commencement date	1 October 2023
Survey latest completion date	30 September 2027
Seismic Source	Double or Triple Source
Size	3,480 in^3
Pressure	2,000 pounds per square inch (psi) (nominal)
Sound source tow depth	7 m
Seismic vessel sail line speed	4.5 knots (8.3 km/hr)
Seismic source discharge interval	18.75 m (8 s – Dual Source); 12.5 m (5.4 s – Triple Source)
Streamers:	
Number of streamers	Up to 14
Streamer length	8 – 10 km
Streamer spread	800 – 1,600 m
Streamer tow depth	10 – 30 m
Vessels:	
Seismic vessel	One vessel – *specific vessel yet to be determined*
Support vessels	Two, one chase vessel and one supply/support vessel – *specific vessels yet to be determined*
Maximum single fuel tank volume	1,066 m^3
Refuelling	Refuelling at sea will occur approximately every 2 - 6 weeks (*depending on the specific vessel, contractor and weather conditions*)
Crew changes	Via helicopter, support vessel or in port approximately every 4 - 6 weeks (*depending on the specific vessel and contractor*)

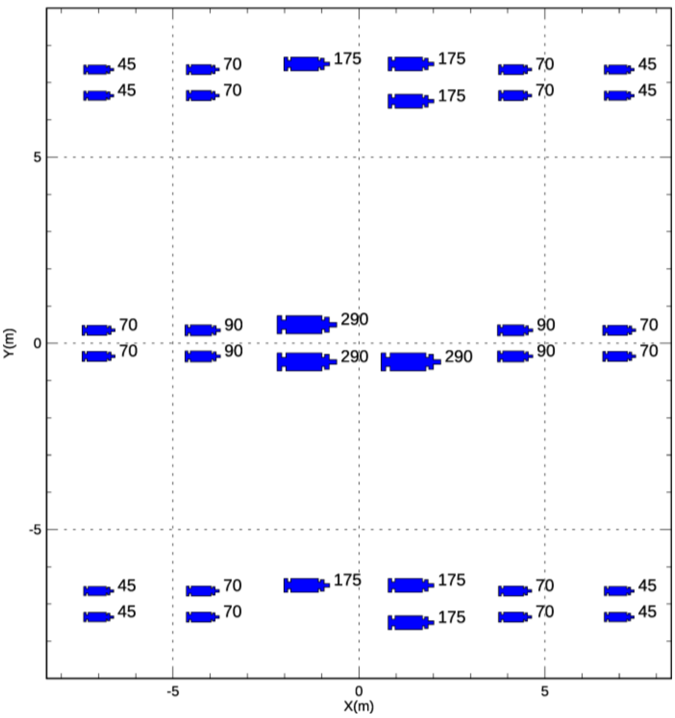
3.5.1 Acoustic Source Configuration

The Otway Basin 3D MC MSS will comprise a single Seismic Vessel towing up to 14 seismic streamers 8 – 10 km in length. The lateral spread of the streamers will be between 800 – 1,600 m. The Seismic Vessel will move at a speed of approximately 4.5 knots (8.3 km/hr).

The acquisition parameters are provided in **Table 9**, while **Figure 5** indicates the source array proposed for the Otway Basin 3D MC MSS.

Table 10 Acquisition Parameters

Parameter	Seismic Survey Parameters
Volume	3,480 in^3
Nominal working pressure	2,000 psi
Source depth	7 m
Vessel speed	4.5 knots (8.3 km/hr)
SP Interval	12.5 m
Number of streamers	Up to 14
Streamer length	8 – 10 km
Width of streamer spread	800 – 1,600 m
Streamer depth	10 – 30 m
Total expected duration	400 days, including continency



Layout of the modelled triple 3,480 in^3 acoustic source array, where the plotted layout is such that the array is centred on the origin and vessel travel direction is in the positive x-direction. The labels indicate the firing volume (in^3) for each airgun.

Figure 5 Acoustic Source Array Proposed for the Otway Basin 3D MC MSS

The acoustic source will either be a 'dual source' (comprising two source arrays discharged alternately) or a 'triple source' (comprising three source arrays discharged alternately). Each acoustic array will have an effective volume of up 3,480 in^3. The acoustic source components are attached to a hanger by chains, with the hanger attached by ropes to a surface buoy for floatation. The acoustic source arrays will be towed behind the Seismic Vessel on an umbilical line at a depth of approximately 7 m below the sea surface.

Each acoustic source component comprises two high pressure chambers: a control chamber and causes an imbalance in pressure between the two chambers. High pressure air is continuously fed to the acoustic source components from compressors onboard the Seismic Vessel. This fills the discharge chamber with high-pressure air while the piston remains in the closed position.

In order to activate the acoustic source, an electrical pulse is sent which opens a valve and forces the piston upwards. This allows the high-pressure air in the chamber to discharge into the surrounding water. The discharged air forms a spherical bubble, which oscillates according to the operating pressure, depth of operation, water temperature, and the discharge volume, ultimately forming a pressure wave. Following this discharge, the piston is forced back down to its original position by the high-pressure air in the control chamber, allowing the sequence to be repeated. The compressors are capable of re-charging the acoustic source rapidly and continuously enabling the source arrays to be fired every few seconds. The proposed firing interval for the Otway Basin 3D MC MSS is every 18.75 m (for a dual source) or every 12.5 m (for a triple source), which translates to the release of the acoustic source every eight seconds, or every 5.4 seconds, respectively.

The volume of the acoustic sources is determined by several factors, such as the objectives of the survey, the complexity of the seabed geology, and the water depths of the AA, and are designed to provide sufficient seismic energy to 'illuminate' the geological objective of the survey (OGP, 2011). TGS determined the preferred source size to be an array with a volume of 3,480 in^3, based on previous surveys in the area, and modelling exercises. This volume aligns with those used in recent marine seismic surveys and has been determined to be sufficient to achieve the goals of the Otway Basin 3D MC MSS in the deeper waters of the Otway Basin, while minimising potential impacts.

Acoustic arrays are designed to direct most of the sound energy vertically downwards, although some residual energy dissipates horizontally into the surrounding water. The amplitude of sound waves generally declines with lateral distance from the acoustic source, and the weakening of the signal with distance (attenuation) is frequency dependent, with stronger attenuation occurring at higher frequencies. The decay of sound in the sea is dependent on the local environmental conditions such as water temperature, water depth, seabed characteristics and depth at which the acoustic signal is generated.

Acoustic arrays such as those that will be utilised for the Otway Basin 3D MC MSS are designed to emit most of their energy at low frequencies, typically ranging between 10 – 300 Hz, with declining energy at frequencies above 200 Hz (APPEA 2015, Popper *et al.*, 2014). Array source sound pressure levels can range from ~241 – 265 dB peak-to-peak at one metre when measured relative to a reference pressure of one micro-Pascal (re 1 µPa m_{p-p}) (Richardson *et al.*, 1995). The overall source level amplitude of a system depends on how many elements are in each array and interaction between elements.

Peak-to-peak pressure is the primary output from the acoustic source (measured by pressure units of bar-m) caused by the expanding high pressure at release, which is measured at a stated reference point (usually 1 m from the source). Using standardised measuring protocols (peak-to-peak) and a reference point enables a comparison of the pressure produced by different acoustic sources. While the units for source level pressure are often reported in bar-m these values have little biological/environmental meaning and sound levels in the water emanating from an acoustic source involved with an MSS are more often presented as dB, calculated from peak-to-peak pressure measurements.

A detailed description of the modelled source signature determined to represent the seismic array is provided in **Section 7.2.1**, including source levels outputs with various directivity. The modelled source signature was characterised by the following maximum levels:

- Peak sound pressure level (**PK**) –258.3 dB re 1 µPa @ 1 m;
- Sound Exposure Level (**SEL**) of 233.8 dB re 1 µPa^2.s @ 1 m.

The source signature modelling enabled conversion between the different parameters (i.e. SEL vs PK), in accordance with the different metrics which define the threshold criteria for sensitive receptors. Using this information, the sound fields from single pulses and accumulated SEL are calculated and used to inform the assessment of potential effects (**Section 7.2**). This source signature simulation, including predictive source levels and directivity, was conducted using JASCOs Airgun Array Source Model and performed by JASCO (**Appendix B**).

3.5.2 Streamer Configuration

A streamer array, with terminal tail buoys, will be towed behind the Seismic Vessel (**Figure 3**). Hydrophones within the streamers detect the low-level sound waves from the acoustic source that are reflected from the geological formations below the seabed. The hydrophones convert this reflected pressure into electrical signals which are digitised and transmitted along the streamers to the recording system on-board the Seismic Vessel.

The streamer array will consist of up to 14 individual streamers, with a lateral spread of 800 – 1,600 m and will have a tail buoy of the terminal end of each streamer to mark its location (**Figure 6**). The streamers will be up to 10 km long which allow for the time delay to adequately capture signals reflected from deep, target subsurface lithologies.

The acoustic source and streamers are towed beneath the surface (**Figure 3**) as this reduces the potential for acoustic interference from the sea surface. The deeper a streamer is towed, the lower the background surface noise; however, this can also result in a narrower bandwidth of received data. TGS will have a streamer depth of 10 – 30 m. Depth is controlled from the Seismic Vessel utilising units called ‘birds’, which provide an accuracy of +/-1 m. Electronically controlled ‘wings’ on the birds pivot in response to changes in pressure (depth) as detected by a pressure transducer inside each bird, automatically pivoting the wings up or down if the streamers pull too deep or shallow (OGP, 2011).

The tail buoy (**Figure 6**) is a large hydrodynamically-shaped buoy that is towed at the terminal end of each streamer, where it serves the following functions:

- Keeping the streamer straight;
- Provides tension at the rear part of the streamer for the birds to efficiently maintain streamer depth;
- Providing a visual reference for the end of each streamer for the vessel and survey crew; and
- Holding a flag, radar reflector and flashing light and an Automated Identification System (**AIS**) transponder to allow other vessels to locate the rear of the streamers.

Each tail buoy will carry a radar reflector and flashing light to mark the end of the array. Tail buoys will also be fitted with a marine fauna deflector (also referred to as a ‘turtle guard’) on the front to ensure marine fauna, in particular marine turtles, are not injured or trapped within the tail buoy.

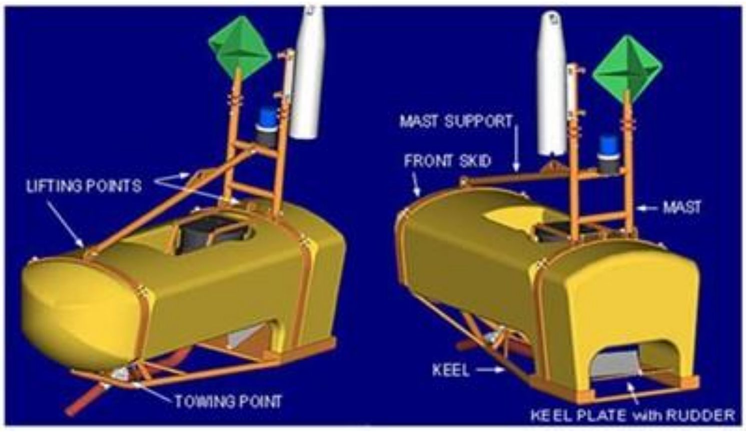


Figure 6 Example of a Seismic Streamer Tail Buoy, with Light, Radar Reflector, and AIS Transponder

3.5.3 Sail Lines, Line Turns and Infill Lines

The data for the Otway Basin 3D MC MSS will be acquired along a series of adjacent and parallel lines, referred to as 'sail lines'. As the vessel manoeuvres from a completed sail line to an adjacent un-surveyed line, the full power array will be inactive through the line turn of the 'racetrack' survey pattern. There may be some bubble tests during the line change, for example if some of the acoustic sources need to be swapped out) before commencement of the soft start procedure. The number and density of sail lines (termed the 'pre-plot') and acquisition geometry are carefully designed to allow suitable coverage of target areas within the AA, whilst optimising the efficiency of the Otway Basin 3D MC MSS.

During line runouts, the seismic source will typically be operated at full volume for the equivalent of half a streamer length (up to 4 – 5 km) before the source is shut down and the survey vessel commences the next line turn. Following completion of the line turn, the vessel will complete a run-in, which involves sailing in a straight line to allow the streamers to straighten prior to recommencing acquisition. During these run-ins, Soft-start Procedures occur for a minimum of 30 minutes (approximately 4 – 5 km), which begins with the operation of the single smallest source element in the array and gradual ramp-up to include additional source elements until the seismic source is operated at full volume for the commencement of the acquisition line. Soft-starts over a period of 30 minutes are a requirement of the EPBC Act Policy Statement 2.1. Soft-start Procedures will also be undertaken prior to commencing the Otway Basin 3D MC MSS, or after a break in the source being active.

The Seismic Vessel has limited ability to manoeuvre whilst towing the streamer and acoustic array, which is mitigated through the presence of a support vessel for the duration of the Otway Basin 3D MC MSS to ensure the area ahead of the survey vessel is clear and engage with any other marine users in the area.

During the Otway Basin 3D MC MSS, situations may arise where the acoustic source will be required to be shut-down. For example, in response to a cetacean entering the Shut-down Zone. If Shut-down Procedures are enacted, the Seismic Vessel will return to acquire the un-surveyed portion of the sail line later. These return acquisitions are termed re-shoot lines. Any infill and/or re-shoot lines required would most likely be completed on a different day.

Activation of the acoustic source along sail lines, during line turns, and when acquiring infill lines will be constrained to within the AA. The AA and associated buffer constitute the OA, as shown in **Figure 4** and as bounded by the coordinates provided in **Table 7** and **Table 8**.

3.5.4 Project Vessels

At the time of preparing this EP, no project vessels had been contracted to complete the Otway Basin 3D MC MSS. TGS will undertake a vessel audit before commencement of the Otway Basin 3D MC MSS to ensure all relevant EPSs will be met onboard the contracted vessels and any potential risks will be reduced to ALARP and Acceptable Levels. If there is any significant difference to what has been assessed, a management of change process would be undertaken (as per **Section 10.4.6**).

3.5.4.1 Seismic Survey Vessel

A purpose-built Seismic Vessel will be contracted for the Otway Basin 3D MC MSS to tow and operate the acoustic source and streamers. The specific vessel has not yet been determined. A small workboat will also be on board the seismic vessel, which may be launched to support equipment deployment, recovery and maintenance activities within the OA. The Seismic Vessel employed for the survey will use marine diesel oil (**MDO**) fuel.

3.5.4.2 Support Vessels

Two support vessels will be contracted for the Otway Basin 3D MC MSS. These vessels will be able to perform some, or all of, the following roles:

- Assist with managing potential interactions between the Seismic Vessel, the seismic array (acoustic source and streamers), and other vessels, receptors, or activities occurring in the area;
- Resupplying, refuelling and emergency towing of the Seismic Vessel; and
- Other support functions, including as a secondary vessel to assist with managing potential interactions with cetaceans and other users of the area.

At least one of the Support Vessels will be selected such that it is of a sufficient size and power to tow a Seismic Vessel in the unlikely event that the Seismic Vessel loses power.

A Support Vessel will be positioned at a safe distance from the Seismic Vessel and towed seismic array and will maintain 24-hour watch, using visual and electronic means, for other vessels or activities which might be approaching or in the path of the Seismic Vessel.

At the time of submission of this EP, the specific vessels have not been contracted. However, both vessels will be smaller than the Seismic Vessel, of suitable class for safely operating in the offshore environment comprising the OA, be crewed by competent persons, have all required operational procedures and systems in-place, and carry all required communication and safety equipment.

3.5.5 Refuelling Operations and Crew Changes

Bunkering will take place at irregular intervals as dictated by the weather (may do several close together if vessel has gone a period without ability to refuel). As above, may also be required to refuel at port if weather does not permit safe refuelling at sea

Wherever possible, crew changes and refuelling (bunkering) for the survey vessels will be undertaken at-sea. However, if environmental (weather does not permit safe refuelling at sea) or logistical issues arise, a port call may be required. To reduce the risk of a fuel spill event, at-sea refuelling operations will occur within the OA and in accordance with the control measures outlined in **Section 8.4** and **Section 8.5**.

Bunkering operations will take place at irregular intervals as dictated by the weather (i.e the Seismic Vessel may be required to undertake some bunkering operations close together if the vessel has gone a period without the ability to refuel), and crew changes will take place every four to six weeks, depending on the specific vessel and contractor. Fresh provisions will be supplied to the survey vessels at crew changes and during bunkering operations as required.

3.5.6 Helicopter

Helicopters may be utilised to transport equipment, supplies and crew to and from the Seismic Vessel during the Otway Basin 3D MC MSS, and also provide emergency medical evacuation, if required.

4 Existing Environment

This section describes the key physical, biological, socio-economic, and cultural characteristics of the existing environment and the sensitivities and receptors that may be affected, both from planned activities and unplanned events associated with the Otway Basin 3D MC MSS. Consequently, the description of the existing environment applies to two areas:

- The OA, as presented in **Figure 1** and described in **Section 3.2.1**.
- The EMBA, as shown in **Figure 7** and further described in **Section 4.1**.

4.1 Environment that May Be Affected

While most planned activities and unplanned events associated with the Otway Basin 3D MC MSS will affect the environment up to a few hundred meters from the acoustic source location, a significant unplanned event, such as a fuel oil spill from a survey vessel, has the potential to impact the existing environment substantially beyond that seen through impacts from planned events. To reflect this and capture all sensitivities that may be affected, stochastic hydrocarbon dispersion and fate modelling (see **Section 8.3.2**) was used to derive the EMBA.

TGS commissioned RPS Limited to model the oceanic dispersal and beaching potential of a hydrocarbon spill from the unlikely situation of a spill event during the Otway Basin 3D MC MSS (**Section 8.3**, **Appendix C**). This modelling simulated the occurrence of 100 realistic spill events of 1,066 m^3 of MDO from five locations within the OA over six hours on the sea surface (and randomly distributed over the previous decade). Once all 100 simulations were run per location, the results were combined to determine the maximum potential extent at which various environmental thresholds were reached, including for floating, entrained, dissolved and shoreline accumulations of hydrocarbons.

The extent of the EMBA (**Figure 7**) was based on a combination of the maximum extent of the spill trajectory at which entrained hydrocarbons were above the low threshold from each of the three modelled release locations. Utilising the maximum extent from all three spill locations results in a worst-case scenario for the spatial extent of impacts from the Otway Basin 3D MC MSS.

Acoustic modelling shows that noise levels exceeding predefined impact thresholds do not exceed the boundary of the unplanned vessel hydrocarbon spill EMBA detailed above. Therefore, the unplanned hydrocarbon EMBA represents the overall EMBA for the activities associated with the proposed Otway Basin 3D MC MSS.

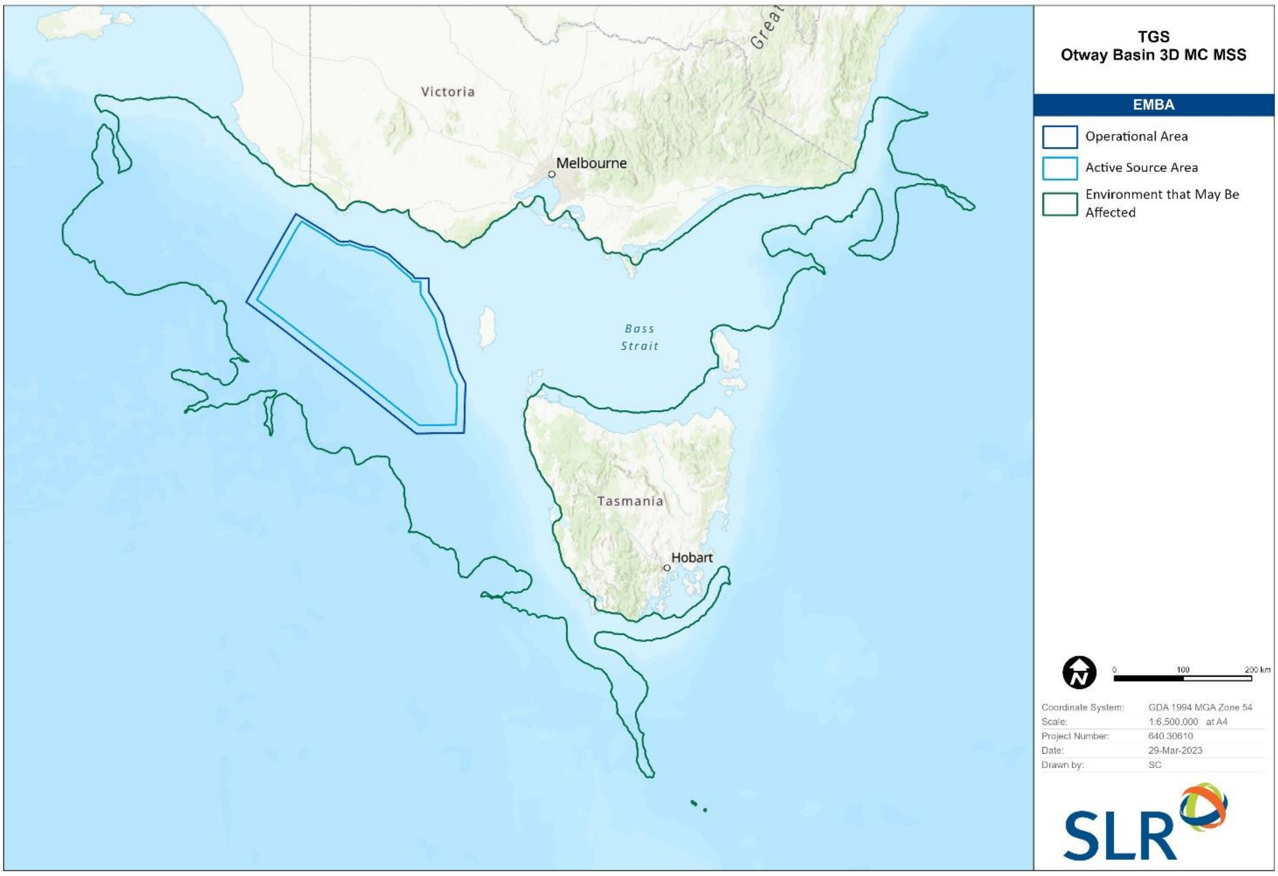


Figure 7 EMBA Associated with the Otway Basin 3D MC MSS

4.1.1 Environmental Values and Sensitivities

As required by Regulation 13(3) of the Environment Regulations, a comprehensive description of the environmental values and key sensitivities within the EMBA has been provided within this EP. Descriptions have been guided by the results of a search utilising the Protected Matters Search Tool from the Department of Climate Change, Energy, the Environment and Water (**DoCCEEW**). The full results from this search are found within **Appendix D**.

4.2 Regional Environment

4.2.1 Marine Regions

In 2008, the former Department of the Environment, Water, Heritage and the Arts (now the **DCCEEW**) introduced marine bioregional planning. Under these plans, the Australian marine environment was categorised into six broad marine bioregions. Marine Bioregional Plans have been developed for four of the six bioregions and describe the marine environment and conservation values of each marine region, set out broad biodiversity objectives, identify regional priorities and outline strategies and actions to address these priorities. The plans are intended to support ecologically sustainable use of ocean resources by marine-based industries while conserving a health and resilient marine environment.

The OA and EMBA are located within the South-East Marine Region (**SEMR**) (**Figure 8**). The EMBA also overlaps with the Temperate East Marine Region, however, this overlap only includes a couple of kilometres into the boundaries of the Temperate East Marine Region and therefore is not described further.

The SEMR incorporates Commonwealth waters extending from near the far south coast of New South Wales, around Tasmania and as far west as Kangaroo Island in South Australia. It includes the Commonwealth waters of Bass Strait and those surrounding Macquarie Island in the Southern Ocean. The SEMR is characterised by the following aspects (CoA, 2015a).

- Significant variation in water depths (60 – 6,700 m) with a number of canyons and seamounts;
- High productivity waters including the Bonney Upwelling and Bass Strait Water Cascade;
- Temperate and sub-Antarctic marine ecosystems which are home to globally significant populations of endemic and internationally threatened species;
- Containing threatened and migratory species listed under the EPBC Act, including cetaceans, pinnipeds, marine reptiles, seabirds and migratory shorebirds and sharks; and
- Containing BIAs, where protected species display biologically important behaviour such as breeding, foraging, resting or migration.

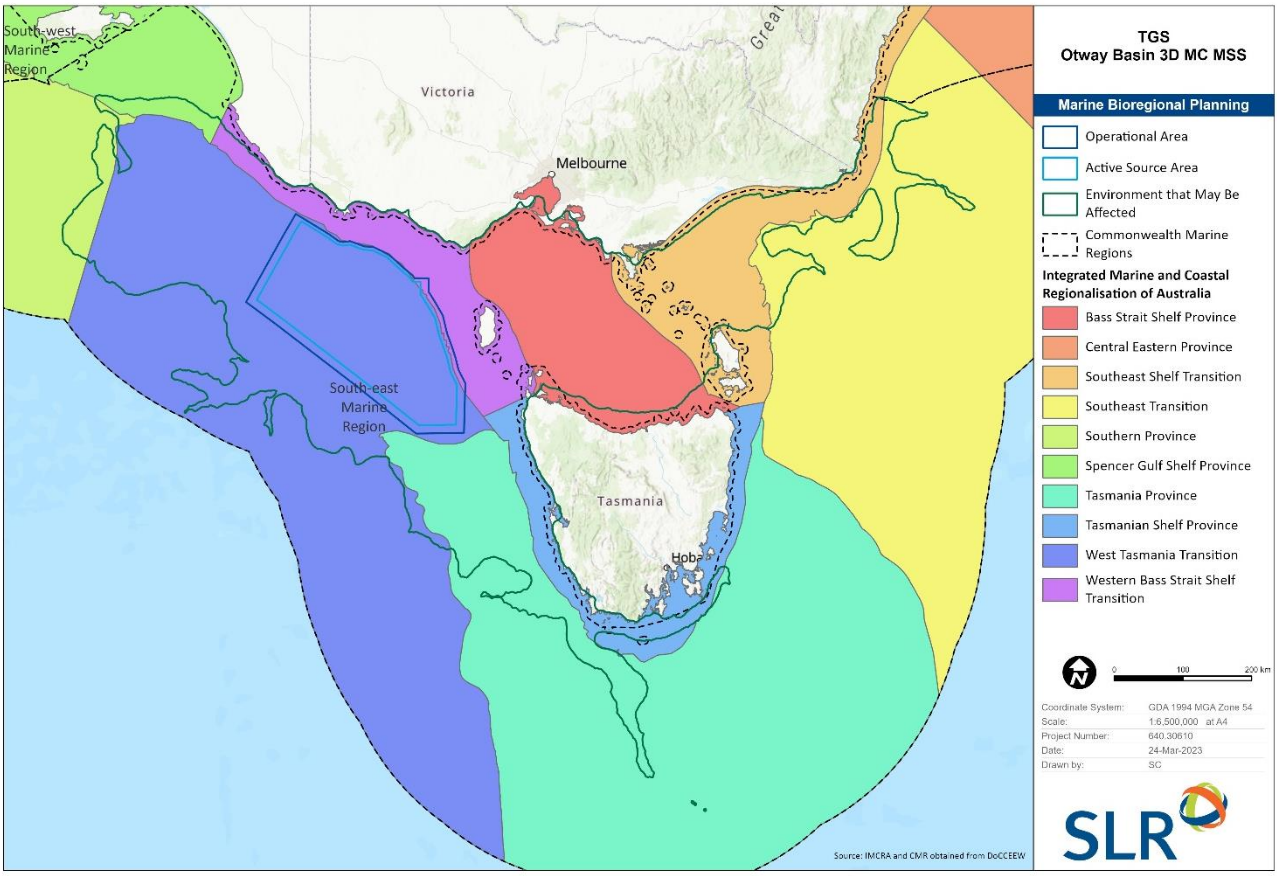


Figure 8 Marine Bioregional Planning in Relation to the OA and EMBA

4.2.2 Provincial Bioregions

The Integrated Marine and Coastal Regionalisation of Australia (**IMCRA**) is a biogeographic regionalization of Australia's marine jurisdiction based on spatial patterns in the benthic and pelagic environment and at scales appropriate to support effective marine planning. Provincial bioregions are principally based on the broad-scale distribution of demersal fish.

As seen in **Figure 8**, the OA overlaps the West Tasmania Transition and Western Bass Strait Shelf Transition. Additionally, the EMBA overlaps with nine provincial bioregions: the Bass Strait Shelf Province, Southeast Shelf Transition, Southeast Transition, Southern Province, Spencer Gulf Shelf Province, Tasmania Province, Tasmanian Shelf Province, West Tasmania Transition, Western Bass Strait Shelf Transition. A brief description of these provinces is provided in **Table 11**.

Table 11 Description of Provincial Bioregions of Relevance to the Otway Basin 3D MC MSS

Provincial Bioregion	Description
Bass Strait Shelf Province	The Bass Strait Shelf Province bioregion covers and area 96,670 km^2 on the shelf region of northern TAS and the Bass Strait. Maximum water depth within this bioregion is 90 m.
Southeast Shelf Transition	The Southeast Shelf Transition bioregion covers 175,540 km^2 of waters around Findlers, Cape Barren, and Clarke Islands across to the Australian mainland and up the east coast. Maximum water depth within this bioregion is 359 m.
Southeast Transition	The Southeast Transition bioregion is location on the southeast margin of Australia. It covers an area of 541,940 km^2 with a maximum water depth of 5,534 m.
Southern Province	The Southern Province bioregion is located off the southern margin of Australia. It covers an area of 774,120 km^2 and includes the Diamantina Fracture Zone, a region of very rugged seabed comprising numerous deep-sea ridges and troughs.
Spencer Gulf Shelf Province	The Spencer Gulf Shelf Province bioregion is located on inshore regions of Spencer Gulf on the southern margin of Australia. It covers an area of 132,860 km^2 out to a maximum water depth of 603 m.
Tasmania Province	The Tasmania Province bioregion covers an area of 300,190 km^2 on the southeast margin of Australia. Maximum water depth within this bioregion is 5,584 m. This bioregion is characterised by many seamounts that contain endemic fish.
Tasmanian Shelf Province	The Tasmanian Shelf Province bioregion is located on the shelf regions of eastern, southern and western TAS. It covers an area of 59,300 km^2 with a maximum water depth of 834 m.
West Tasmania Transition	The majority of the OA and a large part of the EMBA is located within the West Tasmania Transition, a bioregion that covers 289,850 km^2 of deeper, offshore waters of depths up to 5,645 m. The region is commercially important to both the petroleum industry and commercial fishing industry.
Western Bass Strait Shelf Transition	The most northern portion of the OA and EMBA is located within the Western Bass Strait Shelf Transition, a bioregion that covers 37,130 km^2 of water in the inshore shelf region of depths up to 272 m. The region is commercially important to both the petroleum industry and commercial fishing industry.

4.3 Physical Environment

4.3.1 Meteorology

The OA of the Otway Basin 3D MC MSS is located in the Southern Ocean, west of Tasmania. The weather systems in this temperate region are typified by cold, wet winters, and warm, dry summers. Sub-tropical high-pressure systems dominate in summer while sub-polar low-pressure systems are frequent in winter.

Typical wind patterns in the region are south-westerly in summer, and westerly in winter (Sturman, 1996). The OA is located within an area of the 'Roaring Forties', a low-pressure system that often carries strong westerly winds and cold fronts that produce strong winds from the west, north-west and south-west quarters and often result in stormy weather and large waves.

The Integrated Marine Observing System has a mooring deployed in the Bonney Coast region off Cape Bridgewater. This region has strong seasonal upwelling and supports one of the most productive regions of temperate Australian coastal waters (IMOS n.d.).

Weather stations near to the OA include Cape Otway Lighthouse, Portland (Cashmore Airport), Robe and King Island Airport. A summary of the seasonal ranges in mean temperature, rainfall and wind speeds recorded for 1991 – 2020 are presented in **Table 12**.

Table 12 Seasonal Mean Air Temperature, Rainfall and Wind Speed Ranges (1991 – 2020)

Weather Station	Distance from OA	Temperature (°C)	Monthly Rainfall (mm)	Wind Speed (km/h)
Cape Otway Lighthouse[1]	63 km northeast	13.0 – 21.3	41.0 – 119.0	20.2 – 26.7
Portland (Cashmore Airport)[2]	42 km northeast	13.2 – 22.5	30.8 – 112.5	15.2 – 25.6
Robe[3]	160 km northwest	13.9 – 22.7	18.6 – 99.5	16.0 – 26.6
King Island Airport[4]	49 km east	13.3 – 21.2	32.0 – 117.2	19.2 – 29.0

[1]BoM 2021a, [2]BoM 2021b, [3]BoM 2021c, [4]BoM 2021d. * Wind speed ranges include both 9 am and 3 pm conditions.

4.3.2 Air Quality

Air quality across the OA is expected to be high given that air flow originates in the Southern Ocean, and there are no intervening land masses that could influence the quality of air from any anthropogenic or natural terrestrial sources.

4.3.3 Oceanography

4.3.3.1 Currents

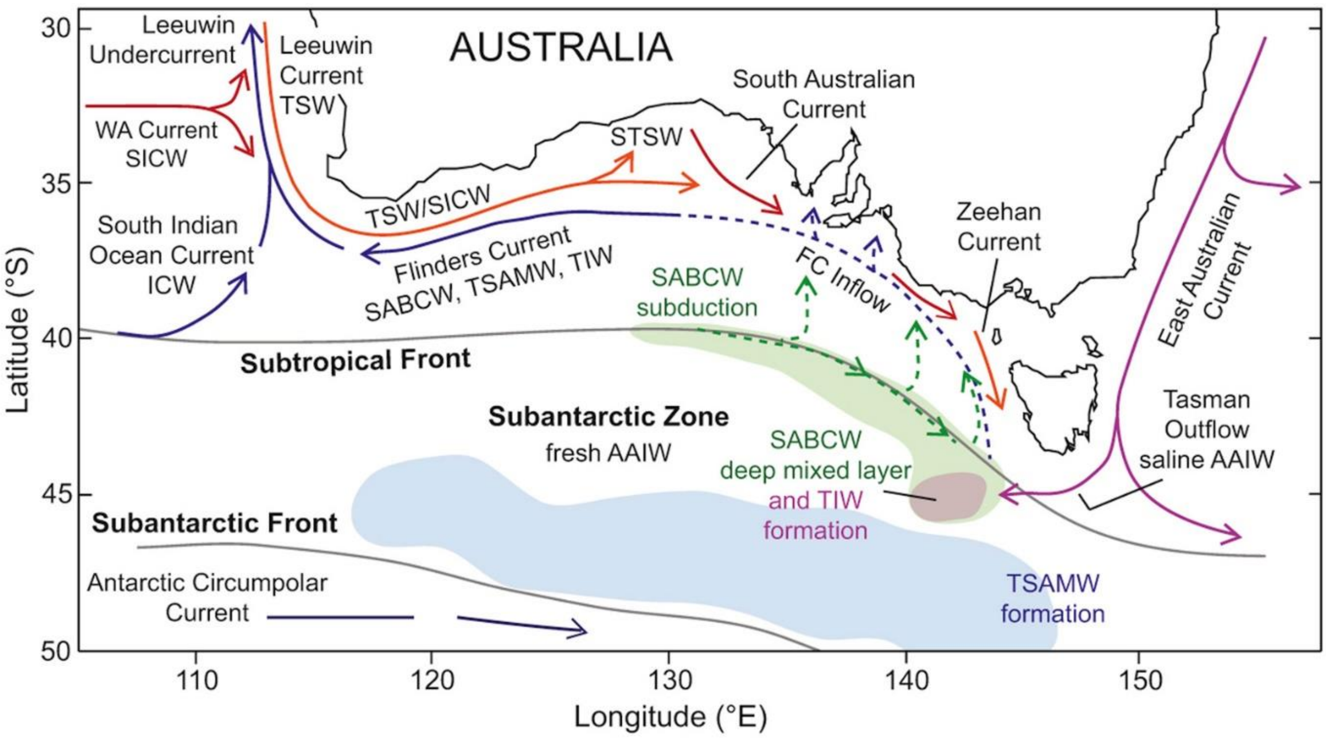
The SEMR is oceanographically complex, with subtropical influences from the north and subpolar influences from the south (CoA, 2015a). The Leeuwin Current transports warm, subtropical water southward along the Western Australian coast and then eastward into the Great Australian Bight (**GAB**) (Ridgway and Condie, 2004) where it mixes with the cool waters from the Zeehan Current running along the west coast of Tasmania. The two mixed currents continue to move east as the South Australian Current (**Figure 9**), splitting into Bass Strait and south along Tasmania's west coast, introducing warm, saline waters to the region. The Leeuwin Current exhibits considerable inter-annual variability, varying relative to coastal winds (Ridgway and Condie, 2004) and is strongest in the austral winter (Waite *et al*., 2007) when southerly winds are strongest (Deng *et al.,* 2008). The path of the Zeehan Current is consistent from year to year as a result of the bathymetric contours along the shelf break where it flows (Ridgway, 2007).

The Leeuwin Current is relatively narrow (approximately 100 km wide) and shallow (<300 m) (Rennie *et al.,* 2007), with speeds across the Great Australian Bight of approximately 0.3 – 0.5 ms^{-1} (Cresswell and Domingues, 2009). The Zeehan Current is even narrower and slower flowing, where it is approximately 40 km wide (Baines *et al*., 1983) with mean speeds of up to 0.3 ms^{-1} (Cirano and Middleton, 2003).

The westward flowing Flinders Current is described as a northern boundary current resulting from surface wind stresses (Middleton and Cirano, 2002). The Flinders Current originates in the Southern Ocean and is associated with deep upwelling over the continental shelf at depths of 600 – 1,000 m (Middleton and Platov, 2003). This current is present year-round (Middleton and Cirano, 2002; Kämpf, 2010) although it is generally strongest in the summer and weakest in winter (Middleton and Bye, 2007). The Flinders Current increases in speed from 0.05 ms^{-1} in the east to 0.2 ms^{-1} in the west where it meets the Leeuwin Current in winter.

The eastern parts of the SEMR are strongly influenced by the East Australian Current (**EAC**) that flows southward adjacent to the east coast of New South Wales (**NSW**), VIC and TAS, carrying warm equatorial waters (**Figure 9**). The EAC is up to 500 m deep and 100 km wide and is strongest in summer when it can flow at up to 5 knots (~9 km). In winter the EAC flows at 2 – 3 knots (~3.5 - 5.5 km) as the oceanographic and climatic drivers in the Coral Sea diminish (CoA, 2015a). The EAC affects sea surface temperatures on the eastern Tasmanian shelf, which can vary substantially among years depending on the relative influence of subtropical waters (CoA, 2015a).

The waters around Macquarie Island to the south of Tasmania are in the path of the Antarctic Circumpolar Current (**ACC**) (**Figure 9**); the largest single current in the world and considered to be a major driver of global climate. The ACC connects the Atlantic, Pacific and Indian Oceans in an eastward flow. The ACC contains a series of jets that continuously combine and separate, acting as a buffer between different masses of water. In summer the ACC is south of Tasmania, which allows the EAC to extend its flow around southern Tasmania. In winter the ACC passes closer to Tasmania and its comparative strength prohibits a weakened EAC from flowing further southward. The interaction of these currents, fronts and sea-floor features influence species composition, distribution, and dispersal, controlling the movement of sediments and nutrients and the seasonal variations in salinity and temperature (CoA, 2015a).



Key: STSW = Subtropical surface water, SABCW = South Australian Basin central water, TSAMW – Tasmanian subantarctic mode water, TIW = Tasmania intermediate water, TSW = Tropical surface water, SICW = South Indian central water, ICW = Indian central water, AAIW = Antarctic intermediate water

Source: Richardson *et al*., (2019)

Figure 9 Major Ocean Currents Along the Southern Australian Coastline

4.3.3.2 Tides

Tides in the Otway Basin are semi-diurnal with some diurnal inequalities (Jones and Pradman, 1983). The maximum range of spring tides in western Bass Strait is approximately 1.2 m. Sea level variation in the area can arise from storm surges and wave set up (Santos, 2004).

Bass Strait is a relatively shallow area on the continental shelf, connecting the southeast Indian Ocean with the Tasman Sea. The Bass Strait is recognised as an area of strong tidal currents, which are primarily driven by tides, winds and density-driven flows. The tides of central Bass Strait are semi-diurnal with the dominant large-scale water movements due to the astronomical tide (Jones, 1980). The tidal waves enter Bass Strait from the east and west almost simultaneously and as a result in the centre of the strait there is an area with small tidal currents where the two waves meet. The magnitude of the tidal currents then increases as the distance from the central strait increases with relatively strong tidal currents at either end. The times and magnitudes of the tide within Bass Strait are relatively uniform and predictable. However, the effects of meteorological phenomena may be significant, causing variations in level and changing the phasing or timing of the tide (Sandery and Kampf, 2005).

4.3.3.3 Waves

Due to the relatively wide and shallow continental shelf of the SEMR, the coast is subject to large storm surges. There are two principal sources of wave energy in the Otway Basin:

- The westerly swell from the GAB and Southern Ocean; and
- Locally generated winds, generally from the west and east.

Wave heights range from 1.5 m to 2 m separated with periods of 8 s to 13 s. Heights of 5 m to 7 m, and up to 10 m can occur during storm events. The Cape Bridgewater wave buoy recorded the lowest wave height for 2020 as 0.78 m (January) and the maximum wave height as 7.93 m (May). The largest waves are associated with eastward-moving low pressure and frontal systems that in winter cross the region every 4 to 6 days.

4.3.3.4 Upwellings

The waters of the SEMR are relatively low in nutrients and primary productivity compared to other marine regions. However, in some locations, water bodies converge and mix to create areas of relatively high biological productivity (DNP, 2013). Seasonal and transient upwellings are an important feature of the SEMR and include the Bonney Upwelling in south-eastern SA, and the Bass Strait Water Cascade on the shelf break east of Bass Strait (CoA, 2015a).

The Bonney Upwelling is the largest and most predictable upwelling in southeast Australia and is present throughout summer months (November to March) (Butler *et al*., 2002). The upwelling is driven by seasonal movements of a subtropical ridge that lies over the Great Australian Bight in summer and pushes southeast winds along the Bonney Coast which interact with regional ocean circulation and climate patterns (as referenced in Nieblas *et al*., 2009). Open ocean waters are moved onto the continental shelf resulting in a shallow thermocline (with increased nutrient concentrations below (Nieblas *et al*., 2009). Within the Bonney Upwelling there are 2 – 3 major upwelling events, each lasting approximately one week (Kämpf *et al.*, 2004). The highly productive Bonney Upwelling system provides a feeding ground for a number of cetaceans (particularly blue whales), pinnipeds, seabirds, and fish, and is important to a number of fisheries (e.g. rock lobster) (Butler *et al*., 2002).

The Bass Strait Water Cascade is a down-welling current originating in the shallow waters at the shelf break east of Bass Strait. The cascade flows down the continental slope into the Tasman Sea (Tomczak, 1987). Winter cooling of the saline waters within Bass Strait forms water that is denser than the adjacent Tasman Sea (Middleton and Cirano, 2005). Water cascades to depths of 300 m or more (Middleton and Cirano, 2005), with the down-flow of denser water creating high-salinity intrusions along the continental slope (Tomczak, 1987). Fish and whales are known to aggregate in these nutrient-rich waters (CoA, 2015a).

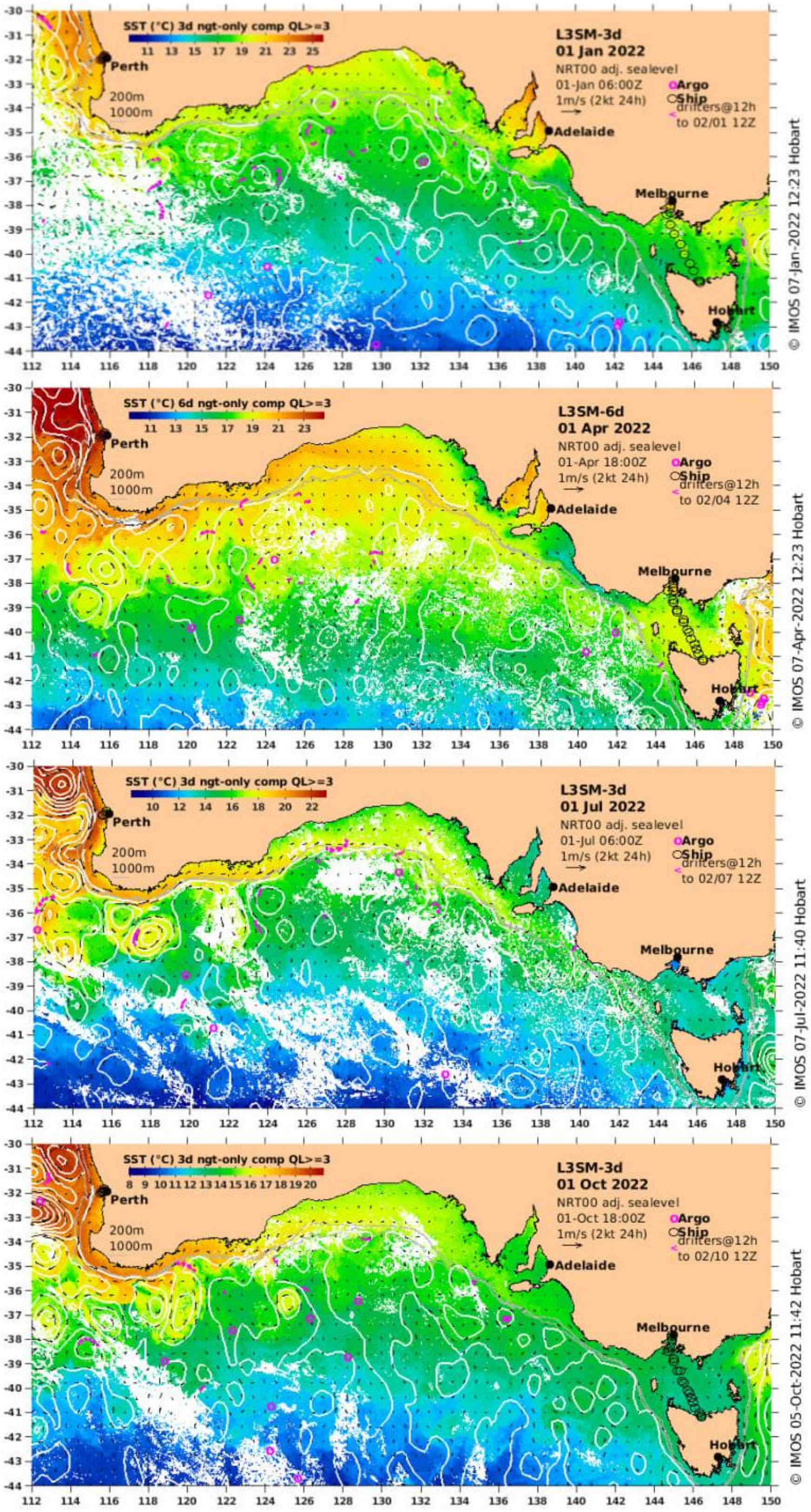
4.3.3.5 Thermoclines and Sea Temperature

Thermoclines occur when cold and relatively warm water separate vertically in the water column and often develop because of solar heating of the upper water column during warmer months. Stratification profiles vary with local environmental conditions; for example, storm conditions can cause significant vertical mixing and breakdown of the thermal structure, and local tides and currents can either enhance or damage the structure of the thermocline. Consequently, a well-defined thermocline is not always present.

Thermoclines can be observed through processed seismic data. A thermocline is characterised by a negative sound speed gradient and can be acoustically reflective. This is a result of a discontinuity in the acoustic impedance of water created by the sudden change in density resulting from the temperature difference. A temperature change of 1°C can result in a change in the speed of sound of 3 ms^{-1} (Simmonds *et al*., 2004).

In the Otway Basin, the winter thermocline intersects the seafloor at the shelf edge caused by deep cold water from the Flinders Current moving northward along the continental slope at the same time as surface warm water from the Leeuwin Current move from west to east (Boult *et al*., 2006). In the summer, the strength of the Leeuwin Current decreases and the Flinders Current becomes more dominant, causing the thermocline to move onto the Continental Shelf (Boult *et al*., 2006).

Sea surface temperatures vary seasonally. Real-time temperatures recorded in 2022 are presented in **Figure 10**. Water temperatures in the Otway Basin range from 12 °C (Spring) to 19° C (Summer) (IMOS, 2023). Minimum water temperatures are reached in the spring, in line with an increased in cold, high productivity waters of the Bonney Upwelling (see **Section 4.3.3.4**).



Graphs represent 2022 data for Summer (January), Autumn (April), Winter (July), and Spring (October)
Source: http://oceancurrent.imos.org.au/

Figure 10 Seasonal Sea Surface Temperature for the Otway Basin

4.3.4 Geomorphology and Bathymetry

The seafloor of the OA varies greatly, but in general covers three seabed types; the continental shelf, deep, and slope between the two (Welch *et al*., 2023). Water depths in the OA range from approximately 95 m to 5,650 m (**Figure 11**). The shelf is narrow (10 – 25 km wide) along the coast of South Australia, VIC and TAS, but widens within the Bass Strait. There are numerous sea-floor canyons along the continental margin throughout the region. Many of these are identified as Key Ecological Features (**KEF**) (**Section 4.4.3**). **Table 13** and **Figure 12** describe the geomorphic features located within the OA (based on IHO, 2001).

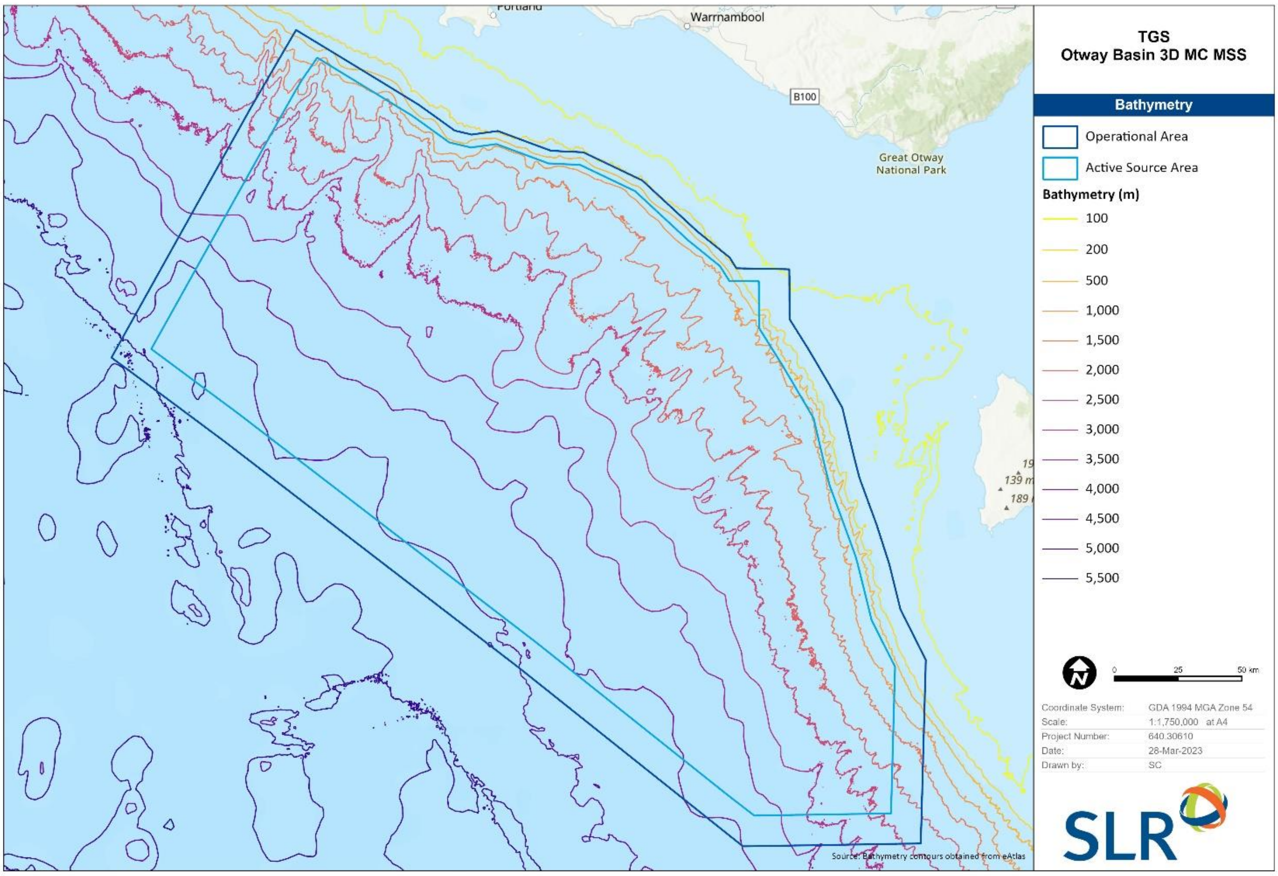


Figure 11 Bathymetry in the OA

Table 13 Geomorphic Features Located Within the OA

Geomorphic Feature	Definition
Canyon	A relatively narrow, deep depression with steep sides, the bottom of which generally has a continuous slope, developed characteristically on some continental slopes.
Shelf	A zone adjacent to a continent (or around an island) and extending from the low water line to a depth at which there is usually a marked increase of slope towards oceanic depths.
Slope	A slope seaward from the shelf edge to the upper edge of a continental rise or the point where there is a general reduction in slope.
Plateau	A flat or nearly flat area of considerable extent, dropping off abruptly on one or more sides.
Knoll	A relatively small, isolated elevation of a rounded shape.
Valley	A relatively shallow, wide depression, the bottom of which usually has a continuous gradient. This term is generally not used for features that have canyon-like characteristics for a significant portion of their extent.
Abyssal-plain/deep ocean floor	An underwater plain on the deep ocean floor, usually found at depth between 3,000 m and 6,000 m.

Source: IHO, 2001.

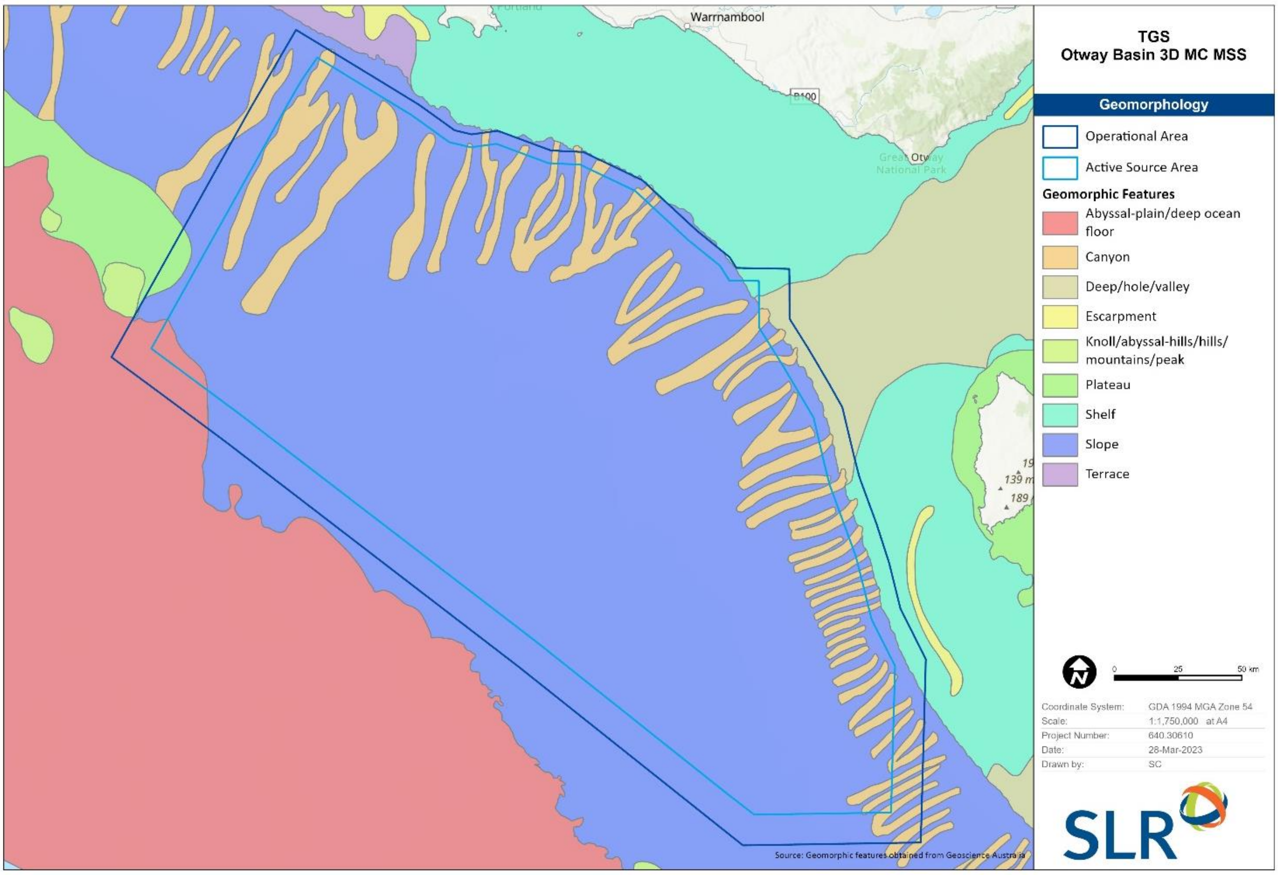


Figure 12 Geomorphic Features within the OA

4.3.5 Geology

The OA lies over the Late Jurassic-Cenozoic Otway Basin which was formed by multi-stage rift-sag and inversion phases (Geoscience Australia, 2018). The main rock types are siliciclastic sediments, sedimentary and carbonate rocks – various sandstones, shales, and mudstones. The Basin's depositional environment is mainly marine in Late Cretaceous and Cenozoic origin, with sediment thickness up to 13 km (Geoscience Australia, 2018).

The Otway Continental Shelf has sediment and sedimentary rock. Coastal sediment sources include recent basaltic rock and carbonate sediment; both lithologies are present below sea level, both on the shallow shelf and as reefs. Unconsolidated seabed sediments are generally carbonate sands (Barton *et al.*, 2012; Murray-Wallace and Woodroffe, 2014). The shelf environment has approximately shelf-edge parallel distribution of surficial sediment facies, with two main facies present. The inner shelf is dominated by hard substrate and palimpsest quartz, bivalve and bryozoan gravels. Unconsolidated sediment cover in this zone is thin or absent (James and Bone, 2011; James *et al.,* 1992). The mid-shelf is dominated by bryozoan sand (Boreen *et al.,* 1993; Harris *et al.,* 2000).

Substrates of the continental shelf (30 m – 180 m) within the OA are expected to be characterised by carbonate sands progressing from coarse to fine with increasing depth, interspersed with low profile limestone outcrops. The seabed of the shelf edge and slope (180 m - >500 m) is expected to consist of muddy carbonate sands and rocky reefs, which disappear with depth (Williams *et al*., 2009). The shelf edge is intersected by canyons and gullies consisting of unconsolidated sediments. The OA overlaps with the sea-floor canyons along the continental margin which is composed of rich organic sediment and debris.

4.3.6 Ambient Noise

Within the marine environment, ambient noise is characterised by a mix of anthropogenic and natural sounds, with the latter broken down into physical sources such as wave activity, rain, tidal turbulence, movement of sediments on the seabed and earthquakes, and biological sources such as fauna that produce sound. Consequently, ambient noise levels will vary spatially and temporally based on their prevailing environmental characteristics including between deep waters versus coastal waters and across different diel cycles (Cato and McCauley, 2002; Harland *et al.*, 2005).

Ambient noise levels throughout the OA are expected to be predominantly associated with natural sources, such as wind and wave movement, seabed sediment movements, and sound-based communications of marine fauna.

The main anthropogenic noise throughout the OA is expected to be associated with commercial vessels along the main shipping routes, in addition to commercial fishing and recreational vessels. The nearest point sources of 'industrial' noise are associated with the existing offshore gas fields shoreward of the OA (see **Section 4.7.5**). The main shore-based sources of industrial noise are at Portland (VIC), where the Alcoa Aluminium Smelter operates (approximately 41 km from the nearest point of the OA), and the Port of Portland which handles the import and export of bulk commodities.

Although measurements of underwater ambient noise levels in the OA are not available, levels can be inferred from other deep-water areas with comparable shipping activity levels. For much of the world's oceans, low frequency noise (10 to 500 Hz) due to distant shipping and wind noise dominates the overall ambient noise environment. At 1,000 m depth at a generalized deep-water site low frequency spectral noise levels range from a minimum of about 60 dB re 1 $\mu Pa^2 Hz^{-1}$ (in the absence of shipping, with low wind) up to around 90 dB re 1 $\mu Pa^2 Hz^{-1}$ with distant shipping (Hildebrand, 2009).

4.4 Marine Protected Areas and Sensitive Areas

4.4.1 Australian Marine Parks

The Australian Marine Park (**AMP**) Network has been established around Australia as part of the National Representative System of Marine Protected Areas which has the primary goal of establishing and effectively managing a comprehensive, adequate, and representative system of marine parks to contribute to the long-term conservation of marine ecosystems and protect marine biodiversity.

In accordance with the EPBC Act, the AMP Network, and any zones within it, must be assigned to an International Union for Conservation of Nature (**IUCN**) Category consistent with the management intent and objectives for that site. IUCN categories include the following:

- Ia – Strict Nature Reserve, no resource extraction;
- Ib- Wilderness Area, First Nations traditional harvesting and collection for scientific research allowed;
- II- National Park, First Nations traditional harvesting and collection for scientific research allowed;
- III – Natural Monument or Feature, First Nations traditional harvesting and collection for scientific research allowed;
- IV – Habitat/species Management Area, sustainable resource extraction allowed;
- V- Protected Landscape or Seascape, sustainable resource extraction allowed;
- VI- Protected Areas with Sustainable Use of Natural Resources, sustainable resource extraction allowed; and
- Y – Assigned, pending further information.

The OA overlaps two AMPs and the EMBA overlaps with a further eight AMPs. These AMPs are depicted in **Figure 13**, and a summary of the environmental, social and cultural values identified for each AMP are described in **Table 14** in accordance with the South-East Marine Reserves Network Management Plan 2013 - 23[2] (DNP, 2013) and the South-West Marine Parks Network Management Plan 2018 (DNP, 2018).

[2] The South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 came into effect on 1 July 2013 and is due to expire in June 2023. As a result, Parks Australia is preparing a new management plan for the South-east Network, with the public consultation period closing on 22 May 2023. The South-east Network will continue to be managed under the current management plan until a new management plan is finalised.

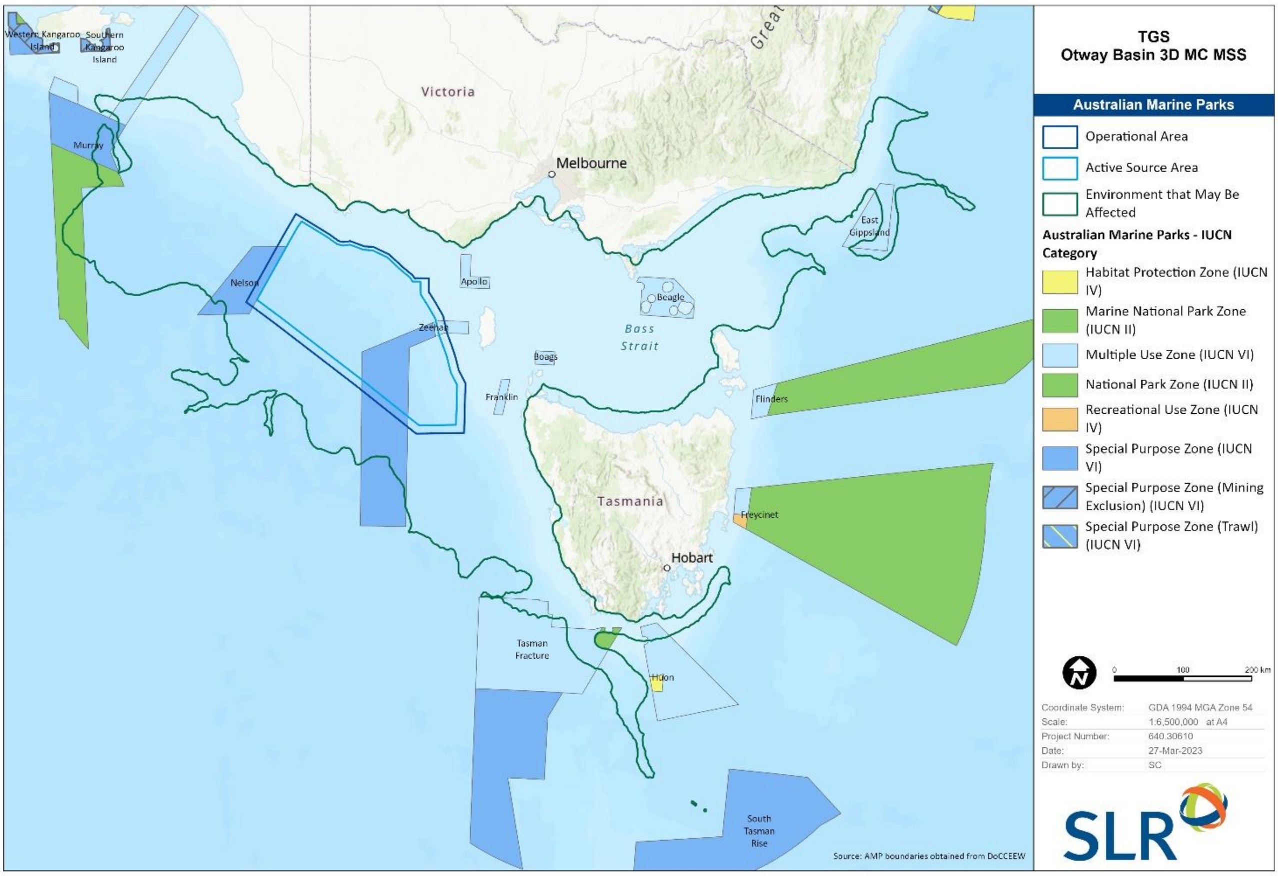


Figure 13 Australian Marine Parks of Relevance to the OA and EMBA

Table 14 Summary of Australian Marine Parks of Relevance to the OA and EMBA

AMP	IUCN Categories	Description	Values
South-east Marine Parks Network			
Zeehan AMP Overlaps with OA and EMBA	Special Purpose Zone (IUCN VI) Multiple Use Zone (IUCN VI)	Zeehan AMP is located south-west of King Island and covers four undersea canyons cutting into the continental shelf (i.e. the West Tasmanian Canyons KEF – **Section 4.4.3**). The Zeehan AMP covers an area of approximately 19,897 km^2, with water depths of 50 m to over 3,000 m. Zeehan AMP is a nursery ground for blue warehou and ocean perch, with concentrations of larval fish of these species found within the marine park. Tasmanian giant crabs are also found in the marine park, making their home in rock limestone continental shelf habitat. Benthic communities found within this region include large sponges, lace corals and other sessile filter feeders.	Examples of ecosystems, habitats, and communities associated with the Tasmania Province, the West Tasmania Transition, and the Western Bass Strait Shelf Transition. Associated with the following seafloor features: abyssal plain/deep ocean floor, canyon, deep/hole/valley, knoll/abyssal hill, shelf, and slope. Important migration area for blue and humpback whales. Important foraging area for black browed, wandering, and shy albatrosses, and great-winged and cape petrels.
Nelson AMP Overlaps with OA and EMBA	Special Purpose Zone (IUCN VI)	Nelson AMP lies approximately 200 km south of SA, beyond the edge of the continental shelf. It consists of rocky knolls, canyons, plateaus, and plains. The AMP covers an area of approximately 6,123 km^2, with water depths below 3,000 m. The waters within and surrounding Nelson AMP are recognised as valuable recreational and commercial fishing grounds for open water fishes, including species of tuna and mackerel. The near-surface waters of Nelson AMP provide an area for whales (i.e. humpback, fin, blue and sei) to commute through the AMP on their way to/from breeding and feeding grounds, and is therefore referred to as a 'whale super-highway'.	Examples of ecosystems, habitats and communities associated with the West Tasmanian Transition. Associated with the following seafloor features: abyssal plain/deep ocean floor, canyon, knoll/abyssal hill, plateau, slope. Important migration area for humpback, blue, fin and sei whales.

AMP	IUCN Categories	Description	Values
Apollo AMP 46 km to OA Overlaps EMBA.	Multiple Use Zone (IUCN VI)	Apollo AMP is located south of Cape Otway and protects an area of continental shelf at the entrance to Bass Strait. It covers an area of approximately 1,184 km^2. It is a shallow water (15 – 20 m) zone that is characterised by intermittent rocky reefs and sandy patches. Apollo AMP is an important area for foraging seabirds; Australian gannet, shy albatross, black-browed albatross, and short-tailed shearwater. Benthic assemblages are dominated by sponges, macroalgae and deep-water corals, as well as mobile macro-invertebrates such as lobsters (Lerodiaconou, 2020). An historic shipwreck, *MV City of Rayville*, lies within this AMP near Cape Otway (**Section 4.6.2**).	Ecosystems, habitats and communities associated with the Western Bass Strait Shelf Transition and the Bass Strait Shelf Province. Associated with seafloor features: deep/hole/valley, and shelf. Important migration area for blue, fin, sei, and humpback whales. Important foraging area for black-browed and shy albatross, Australasian gannet, short-tailed shearwater, and crested tern. Cultural and heritage site: wreck of the *MV City of Rayville*.
Franklin AMP 42 km to OA Overlaps EMBA.	Multiple Use Zone (IUCN VI)	Franklin AMP is located off the north-west corner of Tasmania. It includes a 150 m deep valley etched into an otherwise shallow seafloor. This AMP covers an area of approximately 671 km^2, with water depths from 40 – 150 m. Franklin AMP is an important foraging area for thousands of seabirds from the colonies on nearby Albatross Island, Black Pyramid Rock, and other Hunter Group Islands, including Australasian gannet, shy albatross, and short-tailed shearwater.	Examples of ecosystems, habitats, and communities associated with the Tasmanian Shelf Province, and the Western Bass Strait Shelf Transition. Associated with seafloor features: shelf, deep/hole/valley, escarpment, and plateau. Important foraging area for shy albatross, short-tailed shearwater, Australasian gannet, fairy prion, little penguin, common diving petrel, black-faced cormorant, and silver gull.

AMP	IUCN Categories	Description	Values
Boags AMP 105 km to OA Overlaps EMBA.	Multiple Use Zone (IUCN VI)	Boags AMP is north of Three Hummock Island off Tasmania's north-west coast. It covers an area of approximately 537km^2, with depths from 40 – 80 m. The shallowest waters of the Boags AMP are home to rick arrays of animals that live on the seafloor and in the sediment, including crustaceans, molluscs and bristle worms. Boags AMP is an important foraging area for several seabirds including shy albatross, fairy prion, black-faced cormorant, common diving petrel and little penguin. Boags AMP is on the migration route for the critically endangered orange-bellied parrot as they fly across Bass Strait in Spring and Summer.	Ecosystems, habitats, and communities associated with the Bass Strait Shelf Province. Associated with seafloor features: plateau, and tidal sandwave/sandbank. Important foraging area for shy albatross, Australasian gannet, short-tailed shearwater, fairy prion, black-faced cormorant, common diving petrel, and little penguin.
Murray AMP 232 km to OA Overlaps EMBA.	Marine National Park Zone (IUCN II) Multiple Use Zone (IUCN VI) Special Purpose Zone (IUCN VI)	Murray AMP lies south and east of Kangaroo Island and includes the Murray Canyon. The AMP connects the Murray River to the deep ocean. Murray AMP covers an area of approximately 25,803km^2, with depths from shallow continental waters down to 4,600 m. Murray AMP is an area of high productivity, boosting high marine life of seabirds and whales.	Examples of ecosystems, habitats and communities associated with the Spencer Gulf Shelf Province, the Southern Province, and the West Tasmanian Transition. Associated with sea-floor features: abyssal plain/deep ocean floor, canyon, escarpment, knoll/abyssal hill, shelf, slope, and terrace. Features with high biodiversity and productivity: Bonney coast upwelling, and shelf rocky reefs and hard substrate. Important foraging areas for: blue, sei and fin whales, Australian sea lion, wandering, black-browed, yellow-nosed, and shy albatross, great-winged petrel, flesh-footed and short-tailed shearwater, and white-faced storm petrel. Important breeding area for southern right whale. Important migration area for humpback whale.

AMP	IUCN Categories	Description	Values
Huon AMP 384 km to OA Overlaps EMBA.	Habitat Protection Zone (IUCN IV) Multiple Use Zone (IUCN VI)	Huon AMP is located south-east of Tasmania. It covers a broad depth range from the inner continental shelf at about 70 m, to abyssal depths of more than 3,000 m. Most of the AMP is in deep water.	Examples of ecosystems, habitats and communities associated with the Tasmanian Shelf Province, and the Tasmania Province. Associated with sea-floor features: canyon, knoll/abyssal hill (seamount), pinnacle, saddle, shelf, and terrace. Features with high biodiversity and productivity: seamounts south and east of Tasmania. Important foraging area for: black-browed, Buller’s and shy albatross, great-winged petrel, short-tailed shearwater, fairy prion, Australian fur seal, and orca. Important migration area for humpback whale.
Tasman Fracture 420 km to OA Overlaps EMBA.	Marine National Park Zone (IUCN II) Multiple Use Zone (IUCN VI)	Tasman Fracture AMP extends south-west of Tasmania from the continental shelf to Australia’s exclusive economic zone boundary, 200 nm from land.	Examples of ecosystems, habitats and communities associated with the Tasmania Province, Tasmanian Shelf Province, and the West Tasmania Transition. Associated with sea-floor features: abyssal plain/deep ocean floor, basin, canyon, knoll/abyssal hill, pinnacle, plateau, ridge, saddle, shelf, slope, terrace, and trench/trough. Important migration area for humpback whales. Important foraging areas for: New Zealand fur seal, wandering, black-browed and shy albatross, white-chinned petrel, common diving petrel, short-tailed shearwater, fairy prion, and white shark.

AMP	IUCN Categories	Description	Values
Beagle AMP 274 km to OA Overlaps EMBA.	Multiple Use Zone (IUCN VI)	Beagle AMP lies entirely within Bass Strait, with its north-western edge abutting VIC waters south-east of Wilson's Promontory. It is a shallow-water AMP surrounding a collection of Bass Strait islands. Beagle AMP represents an area of shallow continental shelf ecosystems in depths of approximately 50 – 70 m that extend around south-eastern Australia to the east of TAS. The seafloor that it covers formed a land bridge between TAS and VIC during the last ice age (10,000 years ago).	Ecosystems, habitats, and communities associated with the Southeast Shelf Transition. Associated with sea-floor features: basin, plateau, shelf, and sill. Important migration and resting on migration area for southern right whale. Important foraging area for: Australian fur seal, orca, shy albatross, Australasian gannet, short-tailed shearwater, pacific, and silver gulls, crested tern, common diving petrel, fairy prion, black-faced cormorant, little penguin, and white shark. Cultural and heritage sites: the wreck of the steamship *SS Cambridge* and the wreck of the ketch *Eliza Davies* (**Section 4.6.2**).
East Gippsland AMP 586 km to OA Overlaps EMBA.	Multiple Use Zone (IUCN VI)	East Gippsland AMP contains representative samples of an extensive network or canyons, continental slope, and escarpment at depths from 600 m to more than 4,000 m.	Examples of ecosystems, habitats and communities associated with the Southeast Transition. Associated with sea-floor features: abyssal plain/deep ocean floor, canyon, escarpment, knoll/abyssal hill, and slope. Features with high biodiversity and productivity: Bass Cascade and upwelling east of Eden. Important foraging area for wandering, black-browed, yellow-nosed and shy albatrosses, great-winged petrel, wedge-tailed shearwater, and cape petrel. Important migration area for humpback whale.

4.4.2 State Marine Parks, Marine National Parks, Marine Sanctuaries, Marine Reserves and Fisheries Research Areas

There are no State protected areas within the OA; however, several State protected areas within TAS, VIC, NSW and South Australia occur within the wider EMBA. These are listed within **Table 15**. Due to the number of areas of relevance to the EMBA, a map showing the location of each area has not been provided.

Table 15 State Protected Areas of Relevance to the EMBA

Area Type	Protected Area
VIC State Protected Areas	
Conservation Park	Bay of Islands Coastal Park, Cape Conran Coastal Park, Cape Liptrap Coastal Park, Discovery Bay Coastal Park.
Heritage River	Aire River, Bemm, Goolengook, Arte and Errinundra Rivers, Glenelg River.
Indigenous Protected Area	Deen Maar.
Marine National Park	Bunurong, Cape Howe, Churchill Island, Corner Inlet, French Island, Point Addis, Point Hicks, Port Phillip Heads, Twelve Apostles, Wilsons Promontory, Yaringa.
Marine Sanctuary	Barwon Bluff, Eagle Rock, Marengo Reefs, Merri, Mushroom Reef, Point Danger, The Arches.
Natural Catchment Area	Double Creek, East Gippsland Coastal streams, Mount Vereker Creek.
Nature Conservation Reserve	Bats Ridge W.R., Breamlea F.F.R., Johnstones Creek F.R., Marengo N.C.R., Narrawong, F.R., Nelson SS.R., Salt Lagoon, St Leonards W.R., Seal Islands W.R., Swan Bay – Edwards Point W.R., Tarwin Lower F.R., Tyrendarra F.R., Yambuk F.F.R., Yanakie F.R..
Natural Features Reserve	Aire River W.R., Aireys Inlet B.R., Anglesea B.R., Bald Hills B.R., Barham Paradise S.R., Bass River SS.R., Bellarine I109 B.R., Bellarine I110 B.R., Bittern B.R., Bolwarra H43 B.R., Bolwarra H44 B.R., Bolwarra H45 B.R., Buckley N.C.R., Cape Patterson N.C.R., Conewarre K47 SS.R., Conewarre K48 SS.R., Corinella Cemetery B.R., Crib Point G228 B.R., Crib Point G229 B.R., Curdie Vale N.C.R., Devilbend N.F.R., Drakes B.R., Dromana B.R., Drumdlemara H1 B.R., Drumdlemara H2 B.R., Drumdlemara H4 B.R., Edna Bowman N.C.R., Fingal B.R., Flinders G234 B.R., Flinders N.F.R., French Island G230 B.R., Goose Lagoon W.R., Gorae B.R., Grantville N.C.R., Hedditch Hill S.R., Hopkins Falls S.R., Johanna Falls S.R., Kangerong N.C.R., Kentbruck H14 B.R., Kentbruck H50 B.R., Kilcunda N.C.R., Lady Julia Percy Island W.R., Lake Aringa W.R., Lake Connewarre W.R., Lake Gillear W.R., Latrobe B.R., Lawrence Rocks W.R., Leongatha H3 B.R., Lily Pond B.R., Lonsdale Lakes W.R., Main Ridge N.C.R., Mallacoota, B.R., Merricks Creek B.R., Mortimers Paddock B.R., Mouzie B.R., Mouzie N.F.R., North Western Port N.C.R., Olivers Creek B.R., Portland H46 B.R., Portland H47 B.R., Princetown W.R., Queenscliff N.F.R., Reef Island and Bass River Mouth N.C.R., Rosebud B.R., Screw Creek N.C.R., Tower Hill W.R., Trewalla H48 B.R., Trewalla H49 B.R., Ventnor B.R., Waratah B.R., Warrengine Creek SS.R., Wild Dog B.R., Wild Dog Creek SS.R., Wongarra B.R., Wonthaggi G237 B.R., Wonthaggi G238 B.R., Wonthaggi G239 B.R., Wonthaggi G240 B.R., Wonthaggi G241 B.R., Wonthaggi Heathlands N.C.R., Yambuk Wetlands N.C.R.
National Park	Croajingolong, French Island, Great Otway, Lower Glenelg, Mornington Peninsula, Mount Richmond, Ninety Mile Beach, Point Nepean, Port Campbell, Wilsons Promontory.
National Parks Act Schedule 4 park or reserve	Bunurong Marine Park, Corner Inlet Marine and Coastal Park, Nooramunga Marine and Coastal Park, Shallow Inlet Marine and Coastal Park, Wilsons Promontory Marine Park, Wilsons Promontory Marine Reserve.
Private Nature Reserve	Unnamed C0293, Unnamed P0176.
Other	Phillip Island Nature Park.
Reference Area	Anser Island, Baawang, Benedore River, Calder River, French Island (north), Painkalac Creek, Parker River, Seal Creek, Sony Creek (Otway), Vereker Creek.

Area Type	Protected Area
Remote and Natural Area – Schedule 6 National Parks Act	Rame Head, Southern Wilsons Promontory, Wilsons Promontory Islands.
State Park	Arthurs Seat, Cape Nelson.
State Reserve	Lavinia.
Wilderness Zone	Cape Howe, Sandpatch, Wilsons Promontory.
SA State Protected Areas	
Conservation Park	Carpenter Rocks, Dingley Dell, Douglas Point, Ewens Ponds, Lower Glengelg Rier, Nene Valley, Piccaninnie Ponds.
Forest Reserve	Dry Creek.
Game Reserve	Bucks Lake.
Heritage Agreement	Unnamed No HA1038, Unnamed No HA1166, Unnamed No HA1180, Unnamed No HA1404, Unnamed No HA1457, Unnamed No HA1560, Unnamed No HA26, Unnamed No HA42, Unnamed No HA497.
Marine Park	Lower South East, Upper South East.
National Park	Canunda.
TAS State Protected Areas	
Conservation Area	Arthur Bay, Arthur-Pieman, Blyth Point, Brick Islands, Brougham Sugarloaf, Bun Beetons Point, Cape Wickham, Catamaran River, Cataraqui Point, Chalky Island, City of Melbourne Bay,, Colliers Swamp, Cone Islet, Counsel Hill, Craggy Island, Deep Lagoons, East Moncoeur Island, Egg Beach, Eldorado, Gentle Annie, Goose Island, Harbour Islets, Harcus Island, Henderson Islets, Hogan Group, Hunter Island, Jacksons Cove, Kangaroo Island, Kentford Forest, Kings Run #2, Little Chalky Island, Little Island, Little Trefoil, Low Point, Marshall Beach, Mile Island, Mount Bruny, Mulligans Hill, Murkay Islets, Nares Rocks, Ocean Beach, Pasco Group, Porky Beach, Prime Seal Island, Rebecca Creek, Red Hut Point, Reef Island, Roydon Island, Seacrow Islet, Sea Elephant, Seal Rocks, Sentinel Island, Settlement Point, Shell Islets, Sister Islands, Slaves Bay, Southport Lagoon, Southwest, Stokes Point, Sugarloaf Rock, Tathams Lagoon, Tully River, Wallaby Islands, Wybalenna Island.
Conservation Covenant	Colliers Forest Reserve, Harcus River Road Marrawah, Kentford Road, King Island, Leprena Trust – Sullivan Point, Loorana, Lymwood, Marrawah #1 and #3, Memana, Millwood Road, Mulligans Hill, Nugara, Pegarah Forest, Recherche Bay Reserve – Southport Lagoon, Red Hut Road #1, Reekara Road #1 and #2, Sandfly Beach, Sea Elephant Bootlace, Sea Elephant River, Tambar, Temma, Wicks Road Nugara, Yambacoona.
Game Reserve	Actaeon Island, Bird Island, New Year Island, Petrel Islands, Stack Island.
Historic Site	Cape Sorell, Currie Lightkeepers Residence, D'Entrecasteaux Watering Place, Macquarie Harbour, Strahan Customs House.
Indigenous Protected Area	Badger Island, Preminghana.
Marine Conservation Area	Hippolyte Rocks.
Nature Reserve	Albatross Island, Badger Box Creek, Bass Pyramid, Big Green Island, Black Pyramid Rock, Chappell Islands, Christmas Island, Councillor Island, Curtis Island, Devils Tower, East Kangaroo Island, Isabella Island, Kentford Forest, Lily Lagoon, Muddy Lagoon, North East Islet, Penguin Islet, Reid Rocks, Rodondo Island, The Doughboys, West Moncoeur Island, Wright Rock.
Nature Recreation Area	Emita, Killiecrankie, Mount Tanner, Palana Beach, Recherche Bay.
National Park	Kent Group, South Bruny, Southwest, Tasman.
Private Nature Reserve	Kings Run, Pegarah.
Regional Reserve	Badger River, Four Mile Beach, Mount Dundas, Mount Heemskirk, Teepookana, Tikkawoppa Plateau, Warra Creek, West Coast Range.

Area Type	Protected Area
State Reserve	Calm Bay, Cape Wickham, Disappointment Bay, Pieman River, Seal Rocks, Sundown Point, Three Hummock Island, Trial Harbour, Welcome River, West Point.
NSW State Protected Areas	
National Park	Ben Boyd.
Nature Reserve	Nadgee.

4.4.3 Key Ecological Features

KEFs are the parts of the marine ecosystem that are considered to be of importance for a marine region's biodiversity or ecosystem function and integrity (DoEE, n.d.c). KEFs have been identified by the Australian Government on the basis of advice from technical experts regarding the ecological processes and characteristics of the area.

The OA overlaps with one KEF, the West Tasmania Canyon KEF. In addition to the West Tasmania Canyon KEF, the EMBA overlaps with the following additional KEFs:

- Bonney Coast Upwelling;
- Big Horseshoe Canyon;
- Canyons on the Eastern Continental Slope;
- Seamounts South and East of TAS; and
- Upwelling East of Eden.

A summary of the relevant KEFs within the OA and EMBA is described in **Section 4.4.3.1** to **4.4.3.6** and reflected in **Figure 14**. Unless otherwise stated, all information describing the KEFs of the OA and EMBA has been taken from the Department of Climate Change, Energy, the Environment and Water (**DoCCEEW**) SPRAT Database.

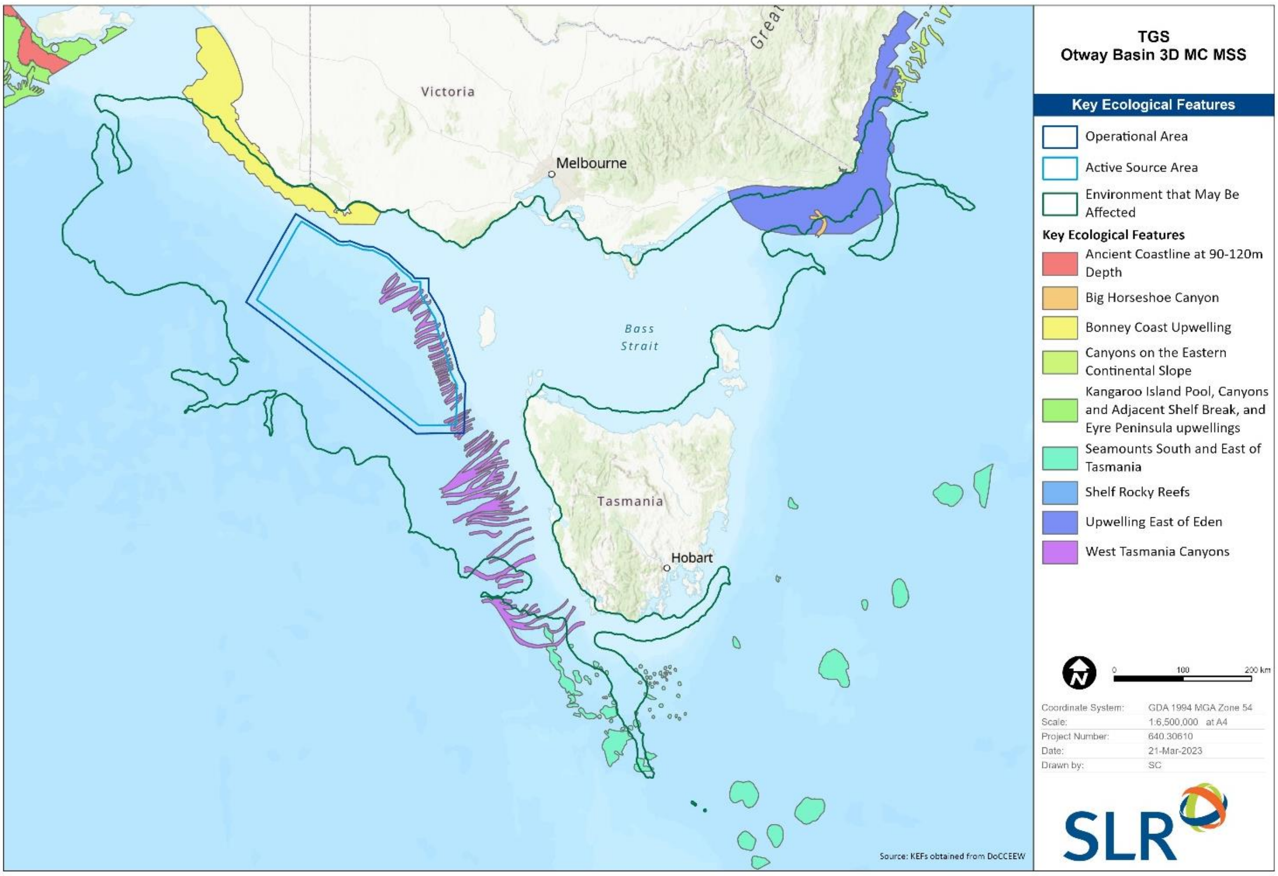


Figure 14 KEFs Identified within the OA, EMBA and Surrounding Waters

4.4.3.1 West Tasmania Canyons KEF

The West Tasmania Canyons KEF is located along the shelf margin, northwest of TAS. The topography and bathymetry of this KEF support a high biodiversity of benthic invertebrates and facilitate high productivity. This KEF overlaps with the boundaries of the OA and EMBA.

The canyons can influence ocean currents, facilitating upwellings that act as a source of nutrients around the canyon heads, and as a sink for rich organic sediments (Commonwealth of Australia, 2015). This results in higher productivity and biodiversity than surrounding waters. The canyon heads are associated with a high cover of sponges and bryozoans, with the greatest diversity between 200 m and 350 m depth (Schlacher *et al.,* 2010). Canyons to the south-east are characterised by bryozoan thickets along canyon rims and heads at 130 m to 350 m depth (Williams *et al*., 2009). Mobile epifauna (e.g. decapods) are found at rock terraces within the canyons at 300 m to 500 m depth, and bioturbating infauna found below 500 m in muddy sediments (Williams *et al*., 2009).

4.4.3.2 Bonney Coast Upwelling KEF

The Bonney Coast Upwelling KEF overlaps with the boundary of the EMBA and lies 12.8 km north of the closest boundary of the OA.

Upwelling events in southern Australian waters occur when seasonal south-easterly winds blow parallel to the shoreline, moving coastal waters offshore primarily between November and March. Cold nutrient-rich waters rise from depths exceeding 3,000 m to the surface via a series of submarine canyons, replacing the displaced coastal waters. Due to the orientation of the southern shelf, areas such as Eyre Peninsula, Kangaroo Island, the Bonney Coast (Robe to Portland) and eastern VIC are susceptible south-easterly winds that encourage upwelling events (Butler *et al*., 2002). The Bonney Coast upwelling is the most prominent of these upwelling systems and occurs along the coast of SA and VIC in areas where the continental slope is very close (~20 km) to shore. Large predictable seasonal upwelling plumes are regularly observed within this region (Schahinger, 1987).

The Bonney Coast Upwelling region supports high productivity and high species diversity in comparison to the surrounding southern Australian waters. A chain effect occurs whereby the cold nutrient rich waters of the upwelling result in increased phytoplankton abundance (represented by high levels of chlorophyll-α); in turn, this attracts zooplankton such as krill (*Nyctiphanes australis*) which feeds on the phytoplankton. Consequently, higher organisms such as fish, seabirds, little penguins (Collins *et al*., 1999), Australian fur seals and blue whales (*Balaenoptera musculus*) are attracted to the area. Other attributes of the area linked to the Bonney Coast Upwelling include its unique algal diversity (Womersley, 1984) and its productivity as a fishery.

The krill species *N. australis* forms swarm aggregations in surface waters, predominantly during summer months in response to increased productivity around the Bonney Coast Upwelling. These aggregations attract feeding blue whales, particularly on the continental shelf between Port Campbell, VIC, and Robe, SA – i.e the Bonney Coast – from December to April/May (Gill, 2001; 2002).

The relationship between the Bonney Upwelling and blue whales' presence has resulted in the Bonney Upwelling being listed as one of the 11 unique marine areas in Commonwealth waters. Furthermore, the Bonney Upwelling is one of 12 widely recognised and well-known blue whale feeding sites worldwide where the whales are known to frequent and feed in relatively high numbers. The Bonney Coast is also recognised as a feeding ground of an endangered species under the EPBC Act. Some authors have indicated that the Bonney Upwelling may be a possible blue whale breeding area although this is not widely agreed upon.

Butler *et al.* (2002) notes that 78 species occurring in the Bonney Upwelling area are covered by one or more of the provisions of the EPBC Act. *'….. Of these, 8 species (5 whales, 2 sharks and 1 bony fish) are not listed marine species but they are listed threatened species under the EPBC Act. The Bonney Upwelling area harbours, in total, 26 listed threatened species: one shark is listed as critically endangered; 5 birds and 2 whales are listed as endangered; and 11 birds, 1 shark, 3 whales and 1 bony fish are listed as vulnerable. The listed marine migratory species include 18 birds and 3 whales*.' Descriptions of several the threatened species associated with the Bonney Upwelling have been provided throughout **Section 4.5**.

4.4.3.3 Big Horseshoe Canyon

The Big Horseshoe Canyon KEF lies south of the coast of eastern VIC and is the eastern most arm of the Bass Canyon system. The KEF lies 554 km east of the OA.

Big Horseshoe Canyon is an area of high productivity and aggregations of marine life. The steep, rocky slopes of this KEF provide hard substrate habitat for large, attached megafauna and sponges and other habitat forming species provide structural refuge for benthic fish such as pink ling. This KEF is the only known temperate location of the stalked crinoid *Metacrinus cyaneu*, which occurs at depths of 200 – 300 m.

4.4.3.4 Canyons on the Eastern Continental Slope

The Canyons on the Eastern Continental Slope KEF lies along the north-eastern most boundary of the EMBA and is an area of high productivity and aggregations of marine life. The KEF lies 724 km northeast of the OA.

This KEF is identified as a unique seafloor feature that contributes to the overall habitat diversity of the seafloor by providing hard surfaces in depth zones where soft sediment habitats prevail. Large benthic sponges and feather stars are abundant, with particularly high diversity found in the upper slope regions (150 – 700 m).

4.4.3.5 Seamounts South and East of Tasmania

The Seamounts South and East of Tasmania KEF overlaps with EMBA south of TAS and is an area of high productivity and aggregations of marine life. The KEF lies 305 km southeast of the OA.

The seamounts within this KEF form a chain of seamounts that rise from the abyssal plain, continental rise, of plateau 200 km or more from shore. These seamounts influence and intensify the surrounding currents where they create localised upwellings and turbulent mixing.

The seamounts with their hard substrate summits and slopes provide attachment points for sessile invertebrates, while soft sediments on the seamounts provide habitat for burrowing species.

4.4.3.6 Upwelling East of Eden

The Upwelling East of Eden KEF overlaps with the EMBA in the north-east and is an area of high productivity and aggregations of marine life. The KEF lies 460 km northeast of the OA.

Dynamic eddies of the EAC cause episodic productivity events within the KEF when they interact with the continental shelf and headlands. This mixing and nutrient enrichment events drive phytoplankton blooms that form the basis of productive food chains. These upwelling events support regionally high primary productivity which in turn supports fisheries and biodiversity. The KEF is one of two feeding areas for blue whales and humpback whales, known to arrive when significant krill aggregations have formed. Other cetaceans, seals, sharks, and seabirds also rely on the KEF.

4.4.4 Biologically Important Areas

Biologically Important Areas (**BIA**s) are regions where a particular species is known or likely to display important behaviours such as breeding, foraging, nesting or migration (DoEE, n.d.c). Whilst BIAs are not matters of national environmental significance and have no legal status, they provide useful biological information intended to help inform regulatory and management decisions under the EPBC Act.

Based on the results contained within the EPBC Act Protected Matters Report, 34 threatened or migratory species were identified as having a BIA that overlaps with either the OA and/or the EMBA. A summary of the relevant BIAs and locational information is provided **Table 16**. Further information on these BIAs is provided in the individual species descriptions in **Section 4.5.3** to **Section 4.5.7**, where relevant.

Table 16 Marine Threatened and Migratory Species BIAs within the OA and EMBA

Class	Species	BIA activity	Closest Location of BIAs	Distance of closest BIA from OA (km)
Elasmobranchs	Grey nurse shark	Foraging	Off the coast of Eden	650 km NE of OA
		Migration (2 BIAs)	Off the coast of Eden	663 km NE of OA
	White shark	Breeding (nursery area)	Corner Inlet	285 km E of OA
		Distribution (2 BIAs)	Between the 60 – 120 m depth contour	Both overlap OA
		Distribution (low density)	Australian waters from Barrow Island/Montebello Islands, Western Australia to Yeppoon/Swains Reef QLD	Overlaps OA
		Foraging	Waters off pinniped colonies throughout the SEMR and SWMR	15 km N of OA
		Known distribution	Coastal/shelf/upper slope waters out to 1,000 m depth contour	Overlaps OA
Marine mammals	Pygmy blue whale	Distribution	N/A[3]	Overlaps OA
		Foraging	The majority of Bass Strait and the coastal waters of Tasmania	Overlaps OA
		Foraging (abundant food source)	Eastern GAB upwelling (Kangaroo Island Canyons)	268 km NW of OA
		Foraging (annual high use area)	Between Cape Otway and Robe. The Bonney Upwelling is a well described pygmy blue whale feeding area	Overlaps OA
		Known foraging area (2 BIAs)	The north-west part of Bass Strait, from Cape Otway to Port Phillip Heads and to the south of King Island	Overlaps OA
	Southern right whale	Aggregation	Bridgewater Bay, Portland to E of Logan's Beach, Warrnambool	14 km N of OA
		Breeding likely	SE Tasmania	381 km SE of OA

[3] No location data provided in BIA files, however, this BIA includes waters offshore from Western Australia around to the VIC/NSW border, including TAS.

Class	Species	BIA activity	Closest Location of BIAs	Distance of closest BIA from OA (km)
		Connecting habitat (3 BIAs)	King Island area	37 km E of OA
		Known core range	Southern Right Whales occur in coastal waters anywhere between Sydney and Perth, including off Tasmania	Overlaps OA
		Migration and resting on migration (6 BIAs)	Victor Harbour area to Portland	32 km N of OA
	Humpback whale	Foraging	From NSW-QLD border to Eden	640 km NE of OA
	Sperm whale	Foraging likely (abundant food source)	Kangaroo Island canyons (south)	326 km NW of OA
	Australian sea lion	Foraging (male)	Great Australian Bight, Eyre Peninsula, Spencer Gulf, Investigator Passage, Gulf of St Vincent and Kangaroo Island	97 km NW of OA
		Foraging (male and female)	Kangaroo Island, Investigator Passage and Gulf of St Vincent	312 km NW of OA
Marine Birds	Wedge-tailed shearwater	Foraging (2 BIAs)	Breeding area / sites buffer-Muttonbird Island (VIC)	Overlaps OA
		Breeding	Montague Island, Muttonbird Island, Broughton Island - Muttonbird Island (VIC)	65 km N of OA
	Short-tailed shearwater	Foraging (3 BIAs)	Buffer around Tasmania including Bass Strait	Overlaps OA
		Breeding (89 BIAs)	Catarqui Point	40 km E of OA
	Wandering albatross	Foraging (2 BIAs)	The whole South-east Marine Region	Overlaps OA
	Antipodean albatross	Foraging (2 BIAs)	The whole South-east Marine Region including Macquaire Island	Overlaps OA
	Australasian gannet	Foraging (4 BIAs)	Buffer around the coast off Portland Vic	Overlaps OA
		Aggregation (7 BIAs)	Lawrence Rocks	39 km N of OA
	White-faced storm-petrel	Foraging (3 BIAs)	Buffer around the northern side of Tasmania into Bass Strait	Overlaps OA
		Breeding (12 BIAs)	Penguin Islet	99 km E of OA
	Common diving-petrel	Foraging	Buffer around Tasmania and Victoria	Overlaps OA
		Breeding (16 BIAs)	Lady Julia Percy Island	45 km N of OA
	Bullers albatross	Foraging	Most of the South-east Marine Region	Overlaps OA
	Shy albatross	Breeding	Albatross Island	89 km E of OA

Class	Species	BIA activity	Closest Location of BIAs	Distance of closest BIA from OA (km)
		Foraging likely	The whole South-east Marine Region	Overlaps OA
	Indian yellow-nosed albatross	Foraging (2 BIAs)	Most of the South-east Marine Region	Overlaps OA
		Foraging likely	The southern edge of the South-east Marine Region	495 km SE of OA
	Black-browed albatross	Foraging (2 BIAs)	The whole South-east Marine Region	Overlaps OA
	Campbell albatross	Foraging (2 BIAs)	The whole South-east Marine Region	Overlaps OA
	Flesh-footed shearwater	Foraging	Region based on Thalman paper	713 km NE of OA
	Sooty shearwater	Breeding (2 BIAs)	Maatsuyker Island	342 km SE of OA
		Foraging (3 BIAs)	Buffer around the south of Tasmania	240 km SE of OA
	Little penguin	Breeding (39 BIAs)	Christmas Island	50 km E of OA
		Foraging (17 BIAs)	Buffer around Christmas Island Tasmania	44 km E of OA
	Southern giant petrel	Foraging	Shelf region NSW coast	716 km NE of OA
	Northern giant petrel	Foraging	Shelf region NSW coast	716 km NE of OA
	Wilsons storm petrel	Migration	Shelf region NSW coast	716 km NE of OA
	Black-faced cormorant	Breeding (16 BIAs)	Christmas Island	50 km E of OA
		Foraging (10 BIAs)	Buffer around Christmas Island Tasmania	44 km E of OA
	Black petrel	Foraging	From Fraser Island to the southern coast of NSW out to and including the area around Lord Howe Island	716 km NE of OA
	Great-winged petrel	Foraging	South-east Queensland and NSW	716 km NE of OA
	Soft-plumaged petrel	Foraging	Buffer around the south of Tasmania	80 km SE of OA
		Breeding	Maatsuyker Island	342 km SE of OA
	White-fronted tern	Foraging	Cape Barren Island	368 km E of OA
	White-capped albatross	Foraging	Shelf region NSW coast, north from TEMR boundary to Sydney	716 km NE of OA
	Crested tern	Foraging	Montague Island	697 km NE of OA

4.4.5 The Australian Whale Sanctuary

The Australian Whale Sanctuary was established to protect all whales and dolphins in Australian waters, which are protected under the EPBC Act 1999. It includes all Commonwealth waters from the 3 NM State Waters limit out to the boundary of the Exclusive Economic Zone (**EEZ**). All States and Territories provide similar protection for cetaceans within Coastal Waters (up to 3NM), and it is the responsibility of the state and territory governments to protect whales and dolphins. Both the OA and EMBA overlap the Australian Whale Sanctuary.

Within the Sanctuary it is an offence to kill, injure or interfere with a cetacean. In all Australian waters, activities with the potential to significant impact on listed or migratory species, such as cetaceans, are regulated under the EPBC Act 1999 (see **Section 2.1.2**). Migratory species within the EPBC Act are those that are listed under international agreements as species whose protection requires or would significantly benefit from international cooperation. Any such proposed activity should therefore be referred to the Minister for the Environment and Heritage for assessment.

Australia is a signatory to the International Convention for the Regulation of Whaling. Obligations under this Convention include provision for the conservation of whales through the complete protection of select species, and the designation of whale sanctuaries (.

4.4.6 Ramsar Wetlands of International Importance

The Ramsar Convention on Wetlands is an intergovernmental treaty that aims to stop international wetland loss and to conserve those that remain. The Convention encourages member countries to nominate sites containing representative, rare or unique wetlands to the List of Wetlands of International Importance ('Ramsar sites'). Ramsar sites are recognised as a matter of national environmental significance under the EPBC Act (DoEE n.d.g). Due to its offshore location, there are no Ramsar sites within the OA, however, seven Ramsar sites occur within the EMBA (**Table 17**, **Figure 15**).

Table 17 Ramsar Wetlands of Relevance to the OA and EMBA

Ramsar Wetlands	Distance from OA
Glenelg Estuary and Discovery Bay Wetlands	37 km N of OA
Piccaninnie Ponds Karst Wetlands	47 km N of OA
The Coorong and Lakes Alexandrina and Albert Wetland	118 km N
Lavinia	63 km E of OA
Western Port	204 km NE of OA
Port Phillip Bay (Western Shoreline and Bellarine Peninsula)	168 km NE of OA
Corner Inlet	280 km NE of OA

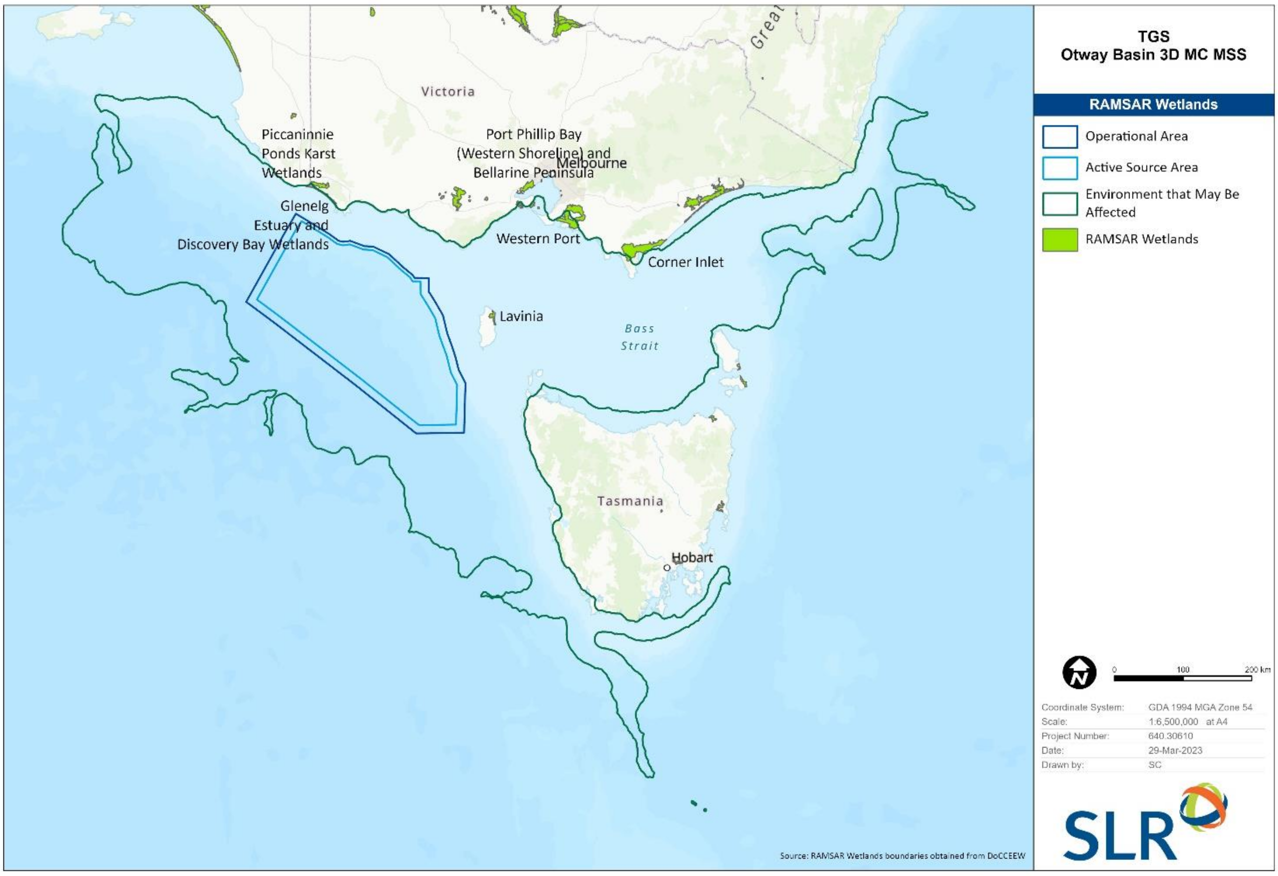


Figure 15 Ramsar Sites of Relevance to the OA and EMBA

4.4.7 Nationally Important Wetlands

Coastal wetlands typically form in the lower reaches of river valleys where they meet estuarine habitat, sometimes forming elongated lakes parallel to the coast and separated from the ocean by dunes. Therefore, water is often brackish in the seaward extents, influenced by the tide and river flows. Some are seasonal, but all provide habitat for numerous species of flora and fauna, particularly waterfowl.

There are no Nationally Important Wetlands located within the OA identified by the EPBC Act Protected Matters Report; however, 37 Nationally Important Wetlands have been identified within the EPBC Act Protected Matters Report as being present within the boundaries of the EMBA. These wetlands are listed in **Table 18** and depicted in **Figure 16**. Due to their distance from the OA, no Nationally Important Wetlands will be affected by routine activities carried out during the Otway Basin 3D MC MSS.

Table 18 Nationally Important Wetlands of Relevance to the EMBA

State	Nationally Important Wetland
VIC	Aire River, Anderson Inlet, Benedore River, Corner Inlet, Glenelg Estuary, Glenelg River, Lake Connewarre State Wildlife Reserve, Long Swamp, Lower Aire River Wetlands, Lower Merri River Wetlands, Mallacoota Inlet Wetlands, Mud Islands, Powlett River Mouth, Princetown Wetlands, Shallow Inlet Marine and Coastal Park, Swan Bay and Swan Island, Sydenham Inlet Wetlands, Tamboon Inlet Wetlands, Thurra River, Tower Hill, Western Port, Yambuk Wetlands.
TAS	Bungaree Lagoon, Lake Ashwood, Lake Bantick, Lake Flannigan, Lake Garcia, Lavinia Nature Reserve, Pearshape Lagoon 1 – 4, South East Cape Lakes, Unnamed Wetland.
South Australia	Ewens Ponds, Piccaninnie Ponds,
NSW	Nadgee Lake and tributary wetlands

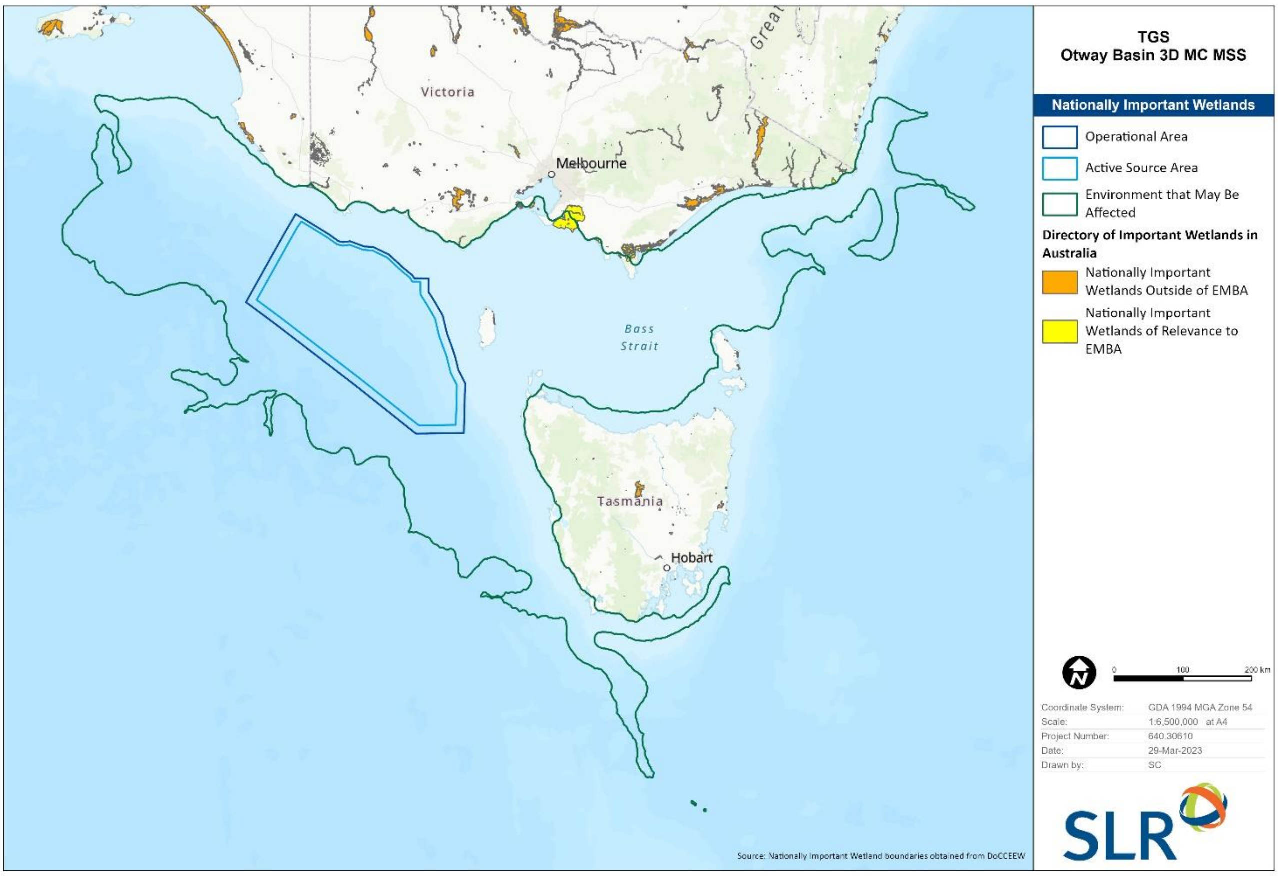


Figure 16 Nationally Important Wetlands of Relevance to the EMBA

4.4.8 State Protected Areas

4.4.9 World, Commonwealth and National Heritage Places

World heritage sites are natural or man-made sites, areas, or structures recognized as being of outstanding universal value by the United Nations Educational, Scientific and Cultural Organization (**UNESCO**). No listed World, Commonwealth or National Heritage places were identified within the OA. One World, six National, and 14 Commonwealth Heritage places were identified within the EMBA, these are identified in **Table 19**.

Table 19 World, Commonwealth and National Heritage Places of Relevance to the EMBA

Heritage Place	Distance from OA
World Heritage Properties	
Tasmanian Wilderness World Heritage Property	184 km SE
National Heritage Places (NHP)	
Quarantine Station and Surrounds	181 km NE
Western Tasmania Aboriginal Cultural Landscape National Heritage Place	81 km E
Point Nepean Defence Sites and Quarantine Station Area National Heritage Place	180 km NW
Recherche Bay (North East Peninsula) Area	369 km SE
Tasmanian Wilderness	188 km SE
Great Ocean Road and Scenic Environs National Heritage Place	57 km N
Commonwealth Heritage Places (CHP)	
Fort Queenscliff	182 km NE
Cape Sorell Lighthouse	165 km SE
Wilsons Promontory Lighthouse	283 km E
Gabo Island Lighthouse	631 km NE
Sorrento Post Office	184 km NE
HMAS Cerberus Central Area Group	215 km NE
Goose Island Lighthouse	355 km E
Tasman Island Lighthouse	423 km SE
Cape Wickham Lighthouse	63 km E
Swan Island and Naval Waters	185 km NE
Swan Island Defence Precinct	185 km NE
Tasmanian Seamounts Area	446 km SE
Cape Northumberland Lighthouse	39 km N
HMAS Cerberus Marine and Coastal Area Group	215 km NE

4.4.10 Threatened Ecological Communities

No TECs overlap with the OA. TECs in nearshore waters and intertidal areas in the EMBA (based on the results presented in the EPBC Act Protected Matters Report include:

- Assemblages of species associated with open-coast salt-wedge estuaries with open-coast salt-wedge estuaries of western and central Victoria ecological community;
- Giant Kelp Marine Forests of South East Australia; and
- Subtropical and Temperate Coastal Saltmarsh.

4.4.10.1 Assemblages of species associated with open-coast salt-wedge estuaries with open-coast salt-wedge estuaries of western and central Victoria ecological community

The Assemblages of species associated with open-coast-salt-wedge estuaries of western and central Victoria ecological community (herein referred to as 'the Assemblages TEC') are listed as Endangered under the EPBC Act.

The Assemblages TECs are in 25 different VIC locations, between the SA – VIC border and the most southerly point of Wilsons Promontory. The Assemblages TECs are in dynamic salt-wedge estuarine systems that experience high wave energy, a microtidal regime (< 2 m), and a temperate climate (TSSC, 2018). Salt-wedge estuaries are usually highly stratified, with saline bottom waters forming a 'saltwedge' below the inflowing freshwater layer of riverine waters. The wedge of heavier marine waters is introduced into the estuary by wave energy and tides. The dynamic nature of salt-wedge estuaries has important implications for the biological structure and ecological function of the Assemblages TEC.

The composition of flora and fauna varies between each of the Assemblages TECs. Primary producers include macrophytes, phytoplankton and protists that live in the water-column, on substrates, or submerged (or intermittently submerged) riparian vegetation along the estuary margins. Beds of seagrass (*Zostera muelleri*, *Ruppia* spp., and *Heterozostera tasmanica*) may occur in the lower to mid reaches of the Assemblage TEC. Fringing wetlands and riparian vegetation adjacent to the main channel may occur and, although not part of the ecological community, are included in this TEC's associated buffer zones.

The faunal composition of the Assemblages TEC comprises many invertebrates: copepods, ostracods, crabs, polychaetes, nematodes, sea jellies and bivalve molluscs. Vertebrates that inhabit the Assemblages TEC include the estuarine black bream and estuary perch.

4.4.10.2 Giant Kelp Marine Forests of South East Australia

The Giant Kelp Marine Forests of South East Australia TEC has been progressively lost, especially on the east coast of TAS, due to changing oceanographic conditions. The largest extent of the ecological community is in TAS coastal waters, with some patches also found in VIC and SA. These patches are protected under Australia's national environmental law, the EPBC Act as a TEC (TSSC 2012a).

Giant kelp is the largest and fastest growing marine plant, and the foundation of the Giant Kelp Marine Forests of South Australia TEC. Other components of the TEC include a large range of marine algae, reef associated fish and numerous invertebrates that shelter, feed, and reproduce within giant kelp marine forests (TSSC 2012a).

4.4.10.3 Subtropical and Temperate Coastal Saltmarsh

This TEC spans six State jurisdictions: Queensland (southern), NSW, TAS, SA, Western Australia (south-western) and VIC. This TEC is found in coastal areas under regular or intermittent tidal influence and is typically restricted to upper intertidal areas with soft sediments generally consist of poorly sorted anoxic sandy silts and clay. The drainage characteristics of coastal soils, along with tidal patterns and elevation, can strongly influence the distribution of flora and fauna within the TEC (TSSC, 2013a).

Although the TEC is found in several Australian regions, it shows geographical zonation between the eastern, southern, and western subgroupings. This means that the species composition of the TEC varies across Australia. In general, the TEC is dominated by salt-tolerant herbs, shrubs, grasses, sedges, and rushes. The non-vascular primary producers in the TEC include epiphytic algae, diatoms, and cyanobacterial mats. The VIC patches of this TEC are dominated by succulent shrubs of the genera *Tecticornia* and *Sarcocornia* in the lower saltmarsh zone, and herbs and grasses in the landward, upper-intertidal zones.

A high diversity of infaunal and epifaunal invertebrates are associated with this TEC. The dominant marine invertebrates are crabs of the families Grapsidae and Ocypodidae. Molluscs are also common in the TEC, and include bivalves, sea slugs of the family Onchidiidae, and several families of gastropods. Shrimp and prawns can swim against currents and are regular, transient visitors to the TEC when it is linked to adjacent aquatic habitats at high tide.

Several vertebrate groups transient fish assemblages are found in the TEC when it is inundated at high tide. These fish are typically adult glassfish (Ambassidae), hardyheads (Atherinidae), or gobies (Gobiidae). The TEC provides important feeding, roosting and refuge habitat for resident and migratory shorebirds (including colonial water birds), as well as foraging habitat for insectivorous bats, terrestrial birds of prey, and seed-eating and insectivorous birds.

4.5 Biological Environment

4.5.1 Plankton and Primary Producers

The term ‘plankton’ describes the drifting organisms that inhabit aquatic environments. Plankton travel with the ocean currents and although some plankton can move vertically within the water column, their horizontal distribution is primarily determined by the surrounding currents. This assessment considers two broad functional planktonic groups:

- Phytoplankton – free-floating organisms ranging from 0.2 to 200 mm in size, capable of photosynthesis, which includes diatoms and dinoflagellates. Phytoplankton fulfil the primary producer role in the ocean and form the basis of the marine food web; and
- Zooplankton – free-floating animals which includes copepods, jellyfish, and larval stages of larger animals.

Primary production within the SEMR is enhanced by broad oceanographic influences (Hosack and Dambacher, 2012):

- The mixing of surface waters with nutrient rich sub-Antarctic waters, leading to high chlorophyll concentrations in the north-eastern Bass Strait; and
- Autumnal and spring bloom of primary productivity observed on the East Tasmania Subtropical Convergence Zone.

These areas of high pelagic productivity support top predators, such as marine mammals, pinnipeds, and seabirds, as well as key commercial fisheries. Interannual variability in the productivity of the Subtropical Convergence Zone has been linked to changes in associated fisheries, as fish may time spawning events, so larvae develop during increased primary production events (Hallegraeff and Jeffrey, 1993; Young *et al*.,1993).

There is limited understanding on the community composition of plankton within the Otway Basin, however, it is thought to be like those found within the Bass Strait and GAB due to geographic proximity and environmental conditions. The eastern GAB has reported seasonal variability in zooplankton community composition. Typically, copepods and cladocerans are dominant members year-round, with elevated chlorophyll-a concentrations during summer/autumn upwellings having a positive association with zooplankton with opportunistic reproductive stages (van Ruth and Ward ,2009).

The planktonic communities of the Bass Strait are influenced by several key upwellings and water flows through the region including the Bass Cascade, East Eden upwelling and the East Australian Current. Whilst copepods are a primary member of these assemblages, ichthyoplankton account for a large proportion of plankton throughout the region, particularly in shallower nutrient rich waters, forming the foundation of several commercial fisheries (Kent *et al*., 2013). It is likely the Otway Basin will display similar plankton assemblages to both the GAB and Bass Strait communities, with influences from temporal and seasonal variations in environmental conditions within the region.

Within the OA, plankton distribution is dependent upon water movement from the Bass Strait and Southern Ocean, as well as localised prevailing currents such as the Leeuwin, Flinders and Zeehan (**Section 4.3.3**) (CoA, 2015). Two key features within the OA promote areas of high productivity:

- The Bonney Upwelling (**Section 4.4.3.2**). A seasonal wind driven coastal upwelling brings cooler nutrient rich water which create areas of high primary production. Significantly, this includes swarms of the coastal krill *Nyctiphanes australis*, the principal *euphausiid* in the area (Hosack and Dambacher, 2012). Surface swarms of coastal krill are predominately a summer phenomenon; however, they have been reported in winter on occasion. These swarms are a key contributing factor to the aggregation of blue whales in the SEMR; and
- The West Tasmania Canyons (**Section 4.4.3.1**). The bathymetry of this KEF has a localised influence on currents, with cold nutrient rich upwelling at canyon heads creating productivity and biodiversity hotspots.

4.5.2 Benthic Habitats and Communities

The distribution of benthic communities in the SEMR is largely dependent on water depth, nutrient availability, and substrate and sediment characteristics. Due to the OA having a large depth range down to approximately 5,000 m, a range of different habitat/substrate types, and consequently benthic communities will be present. The seabed of the shelf edge and slope (180 m - >500 m) is expected to consist of muddy carbonate sands and rocky reefs, which disappear with depth (Williams *et al*., 2009). The shelf edge is intersected by canyons and gullies consisting of unconsolidated sediments. The hard substrates and rocky reliefs provide attachment points for a broad range of sessile epifauna, whereas infauna can be found within the sediments.

Information on benthic invertebrate communities within the OA is limited. However, the likely benthic invertebrate communities within the OA are based on studies for nearby areas. The southern Australian waters are reported as having a variety of seabed habitats, supporting diverse infaunal and epifaunal communities, which display little evidence of any distinct biogeographic regions (Poore *et al.,* 1985; Wilson and Poore, 1987).

The Continental Shelf is likely to be sparsely covered by macroalgae, sessile filter feeders (e.g. sponges, bryozoans, bivalves, scallops, stalk crinoids, soft corals), mobile macro-invertebrates (e.g. echinoderms, crustacean) and bioturbating infauna (e.g. annelids) (Hosack and Dambacher, 2012; Williams *et al.,* 2009). Studies by the Museum of Victoria found high invertebrate diversity across the SEMR, but patchy distribution and little evidence of distinct biogeographic regions (Butler *et al.*, 2001). Whilst hard corals are generally associated with tropical waters, some habitats conducive to deep-water corals can be found within the SEMR, as well as two reports of octocorals along the Continental Shelf. Deepwater corals are generally limited to water depths of less than 1,000 m and unlikely to be a dominant habitat throughout the SEMR (VEAC, 2019). Several areas that overlap the OA support a high diversity of benthic assemblages, namely the Apollo and Zeehan AMPs (**Section 4.4.1**) and West Tasmania Canyons KEF (**Section 4.4.3.1**).

One species of threatened seastar, the Tasmanian live-bearing seastar (*Parvulastra vivipara*), was identified within the EPBC Act Protected Matters Report as potentially present within the EMBA. This species is listed as Vulnerable under the EPBC Act 1999 and under the Tasmanian Threatened Species Protection Act 1995. Tasmanian live-bearing seastars inhabit sheltered waters in the upper intertidal zone of rocky areas of southeast TAS and therefore will not be affected by planned activities associated with the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill.

4.5.3 Bony Fish and Elasmobranchs

The EPBC Act Protected Matters Report identified three species of threatened fish, three species of threatened shark, and two species of migratory shark within the OA. A further 20 species of pipefish, two species of seahorse, two species of seadragon, and two species of pipehorse have also been identified within the OA which are not listed as threatened or migratory. Within the EMBA there are 12 species of threatened fish and seven species of threatened elasmobranch (i.e sharks, rays, and skates) identified within the EPBC Act Protected Matters Report. An additional 4 migratory elasmobranch species and 36 species of not threatened or migratory fish (pipehorses, pipefish, seahorses, and seadragons) have been identified within the EMBA.

Threatened and migratory species are further described in **Section 4.5.3.1.1** (bony fish) and **Section 4.5.3.1.2** (elasmobranchs), with the full list of fish and elasmobranchs identified within the OA and EMBA provided in the EPBC Act Protected Matters Report (**Appendix D**).

4.5.3.1 Bony Fish

Temperate fish assemblages across the SEMR consist of pelagic, demersal, and nearshore species, with deepwater fishes the most relevant to the region. Habitats, such as rocky reefs and sponge gardens, provide refuge for herbivorous fish or important nursery grounds for commercially viable species (Butler *et al.*, 2002a). Reef dwelling fish include wrasse, leatherjacket, scalyfin, and bream, and are widely distributed though the TAS and south Australian coastline. Pelagic assemblages include several tuna species, marlin, lanternfish, mackerel, sardine and redbait (Bulman *et al.*, 2008). Demersal assemblages include orange roughy, deepwater flathead, whiting and grenadier, however, assemblages below 1,125 m are data deficient (CSIRO, 2001).

The sygnathids (pipefish, pipehorses, seahorses, and seadragons) identified in the EPBC Act Protected Matters Search occur broadly across the western, south-western, south-eastern and eastern Australian waters. It is likely the principal habitat that may support syngnathids within the OA is inner shelf areas of less than 50 m, including the Zeehan and Apollo Marine Parks, as well as within rocky reefs and floating kelp mats found across the SEMR. Benthic cover and rugosity of substrate is likely to be a key factor in determining site-attached fish habitats.

Other key areas of fish aggregation are localised upwellings, including the Bonney Upwelling and West Tasmania Canyons, where increased primary production is capitalised on by migratory species such as tuna and large sardine schools (Butler *et al.*, 2002b).

4.5.3.1.1 Bony Fish Listed Threatened Species

12 threatened fish species were identified within the EPBC Act Protected Matters Report as potentially occurring in the OA and/or the wider EMBA. A description of the threatened bony fish species identified in the EPBC Act Protected Matters Report is provided in **Table 20**. There are no bony fish species listed as migratory identified within the OA or EMBA.

Table 20 EPBC Act List of Threatened Bony Fish Species Identified within the OA and/or EMBA

Species	EPBC Act Status	Description of species and potential to occur within the OA and EMBA
Orange roughy *Hoplostethus atlanticus*	CD	Orange roughy are found in cold, deep waters of the Atlantic, Pacific and Indian Oceans. In Australia this species occurs across the southern half of the continent, from central NSW through to southwestern Australia, including TAS (Kailola *et al*., 1993). Orange roughy are a demersal species most found on the Continental Slope at 500 – 1,400 m depth (Gomon *et al*., 2008) where they often aggregate around seamounts such as the South Tasman Rise and Cascade Plateau in the SEMR (Kailola *et al*., 1993). The first major orange roughy spawning ground was discovered in 1989 off northeastern TAS and a summer fishing ground was discovered off southern TAS (Koslow *et al*., 1995). Catch data indicates that there has been a significant decline in orange roughy populations in Australia since the establishment of the commercial fishery in late 1980. Orange roughy are likely to be present within the OA during the Otway Basin 3D MC MSS. **Relevant management plan**: No adopted EPBC documented recovery plan for orange roughy. **Key threats**: The main threats to orange roughy are commercial trawling and habitat damage (mainly through bottom trawling over seamounts).
Blue warehou *Seriolella brama*	CD	Blue warehou are restricted to Australian and New Zealand waters (Kaschner *et al*., 2010). In Australia, this species occurs predominantly in coastal shelf, upper continental slope, and seamount waters offshore from NSW, TAS, VIC and South Australia (Gomon, 2008). Blue warehou inhabit water depths between 3 and 550 m (Bray and Gomon, 2011), but is more abundant in waters shallower than 200 m (Gavrilov and Markina, 1979). Blue warehou are managed by the Australian Fisheries Management Agency (**AFMA**) as two stocks: an eastern stock extending offshore from southern NSW southwards to southeastern TAS, and a western stock extending offshore from western TAS northwards to western VIC. Spawning occurs three times each year. The main spawning period in the eastern stock occurs between May and August each year, while in the western stock, spawning occurs between June and October each year (Knuckey and Sivakumaran, 2001). Post spawning, the larvae disperse widely during winter and spring months within shelf and slope waters (Bruce *et al*., 2001). Blue warehou are likely to be present within the OA during the Otway Basin 3D MC MSS. **Relevant management plan**: No adopted EPBC documented recovery plan for blue warehou, however, a Listing Advice is in effect from 14 February 2015. **Key threats**: The main threat to blue warehou is overfishing in the commercial fishery.
Southern bluefin tuna *Thunnus maccoyii*	CD	See **Section 4.5.3.1.2** for a full discussion on southern bluefin tuna. Based on the tracks of tagged adult southern bluefin tuna depicted in **Figure 20**, adults may be present in the OA from October to December (Patterson *et al*., 2015). **Relevant management plan:** No adopted EPBC documented recovery plan for southern bluefin tuna, however, a Listing Advice is in effect from 15 December 2010. **Key threats:** The main threat to southern bluefin tuna is historic and ongoing fishing pressure.

Species	EPBC Act Status	Description of species and potential to occur within the OA and EMBA
Spotted handfish *Brachionichthys hirsutus*	CE	Spotted handfish are a slow-moving benthic species endemic to south-east TAS. This species is currently known from the lower Derwent Estuary and D'Entrecasteaux Channel (Bruce *et al*., 1998) in small, fragmented populations (Last and Gledhill, 2009). They associate with coarse to fine sand and shell grit of stilt (DPIWE, 2002) at depths of 1 – 60 m, but most commonly in depths of 5 – 15 m (Last and Gledhill, 2009). Spotted handfish will not be present within the OA and will not be affected by routine planned activities during the Otway Basin 3D MC MSS, however, this species is of relevance with regard to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: Recovery Plan for Three Handfish Species 2015. Objectives of the recovery plan are to ensure an ecologically functional wild population of spotted handfish that, with limited site-specific management, has a high likelihood of persistence in nature, and to increase the understanding of the biology and ecology of spotted handfish to conserve, and contributed to the future recovery of the species. **Key threats**: Key threats include loss/degradation of habitat, pollution, and siltation of waterways from diffuse and point-source activities, traditional boat moorings, and the spread of the invasive Northern Pacific seastar.
Ziebell's handfish *Brachiopsilus ziebelli*	V	Ziebell's handfish are a benthic species restricted in distribution to eastern and southern TAS in widely disjunct populations (Last and Gledhill, 2009). This species has been recorded at Bicheno, Forestier Peninsula, Tasman Peninsula, Actaeon Islands, and Cox Bight in water depths of 10 – 20 m (Last and Gledhill, 2009). Ziebell's handfish prefer soft bottomed habitat, with patches of rock that support sponge and algae communities. Ziebell's handfish will not be present within the OA and will not be affected by routine planned activities during the Otway Basin 3D MC MSS, however, this species is of relevance with regard to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: Recovery Plan for Three Handfish Species 2015. Objectives of the recovery plan are to increase the understanding of the biology and ecology of Ziebell's handfish to conserve and contributed to the future recovery of the species. **Key threats**: Key threats include loss/degradation of habitat, pollution, and siltation of waterways from diffuse and point-source activities, traditional boat moorings, and the spread of the invasive Northern Pacific seastar.
Black rockcod *Epinephelus daemelii*	V	The distribution of black rockcod in Australia ranges from southern QLD through NSW to northern VIC, with records from QLD and VIC rare. The species generally inhabits near-shore rocky and offshore coral reefs at depths down to 50 m. Black rockcod have not been identified as present within the OA, however, they have been identified within the EMBA, therefore this species is of relevance with regard to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: No adopted EPBC documented recovery plan for black rockcod, however, an Approved Conservation Advice is in effect from 4 April 2012, and a Listing Advice is in effect from 4 April 2012. **Key threats:** Key threats to black rockcod are incidental by-catch by recreational and commercial fishers and illegal fishing activities.

Species	EPBC Act Status	Description of species and potential to occur within the OA and EMBA
Australian grayling *Prototroctes maraena*	V	Australian grayling occur in both freshwater and marine environments; the larvae and juveniles occur in coastal waters while the adults inhabit freshwater streams and rivers (Miles *et al*., 2013). This species spawns during late summer and winter, with eggs hatching after 10 – 20 days. Larvae drift downstream to the ocean and spend around six months at sea before returning permanently to the freshwater environment (Berra, 1982; Backhouse, *et al*., 2008). The Australian grayling occurs in freshwater environments on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of VIC, and in TAS (DoCCEEW, 2023). As such, larvae and juveniles may occur in coastal waters of the inshore portion of the OA. Due to their freshwater distribution, adult Australian grayling will not occur within the OA during the Otway Basin 3D MC MSS; however, larvae may be present in the OA following the spawning period. **Relevant management plan**: National Recovery Plan for Australian Grayling *Prototroctes maraena.* This plan details the actions necessary to ensure the long-term survival of the species. **Key threats**: The identified threats are largely freshwater catchment based (e.g. barriers to fish migration, changes in river flows, degradation of riparian habitat, etc.) and there is no mention of any specific threats from seismic activities (e.g. noise or marine pollution.
Eastern gemfish (eastern Australian population) *Rexea solandri*	CD	Gemfish in Australian waters are divided into two fragmented and genetically isolated stocks; an eastern stock distributed from Cape Moreton, southern QLD, along the east coast to Bass Strait and the waters off TAS, and a western stock distributed from Ningaloo Reef and Geraldton through the GAB (Colgan and Paxton, 1997). The eastern stock is of relevance to the Otway Basin 3D MC MSS. The eastern gemfish population underwent a significant population reduction as the result of commercial fishing operations. Eastern gemfish inhabit deeper Continental Shelf habitats and upper slope waters from 100 to 700 m, but generally in waters 250 to 500 m. Adults are generally caught close to the seafloor but are likely to move to mid-waters at times (Kailola *et al*., 1993; Pogonoski *et al*., 2002). Larvae occur in shallow to very shallow waters (Pogonoski *et al*., 2002). Mature fish undertake annual migrations up the eastern Australian coast to spawning grounds off the NSW mid-coast, arriving between June and August (Pogonoski *et al*., 2002). Larvae have been caught in coastal waters off Sydney from July to September, and in coastal and offshore waters off northern and central NSW from August to September (Rowling and Makin, 2001). **Relevant management plan:** No adopted EPBC documented recovery plan for eastern gemfish, however, Listing Advice is in effect from 22 January 2009. **Key threats:**

Species	EPBC Act Status	Description of species and potential to occur within the OA and EMBA
Red handfish *Thymichthys politus*	CE	Red handfish are a slow-moving benthic species that is currently known from a single site at Primrose Sands Reef in Frederick Henry Bay (TAS). They occur in variety of habitats, such as on the top of rocks, amongst macro-algae and in sandy areas between rocks and the reef-sand interface at a depth distribution of 1 – 20 m (Last and Gledhill, 2009). Red handfish will not be present within the OA and will not be affected by routine planned activities during the Otway Basin 3D MC MSS, however, this species is of relevance with regard to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: Recovery Plan for Three Handfish Species 2015. Objectives of the recovery plan are to increase the understanding of the biology and ecology of red handfish in order to conserve and contribute to the future recovery of the species. **Key threats**: Key threats include loss/degradation of habitat, pollution and siltation of waterways from diffuse and point-source activities, traditional boat moorings, and the spread of the invasive Northern Pacific seastar.

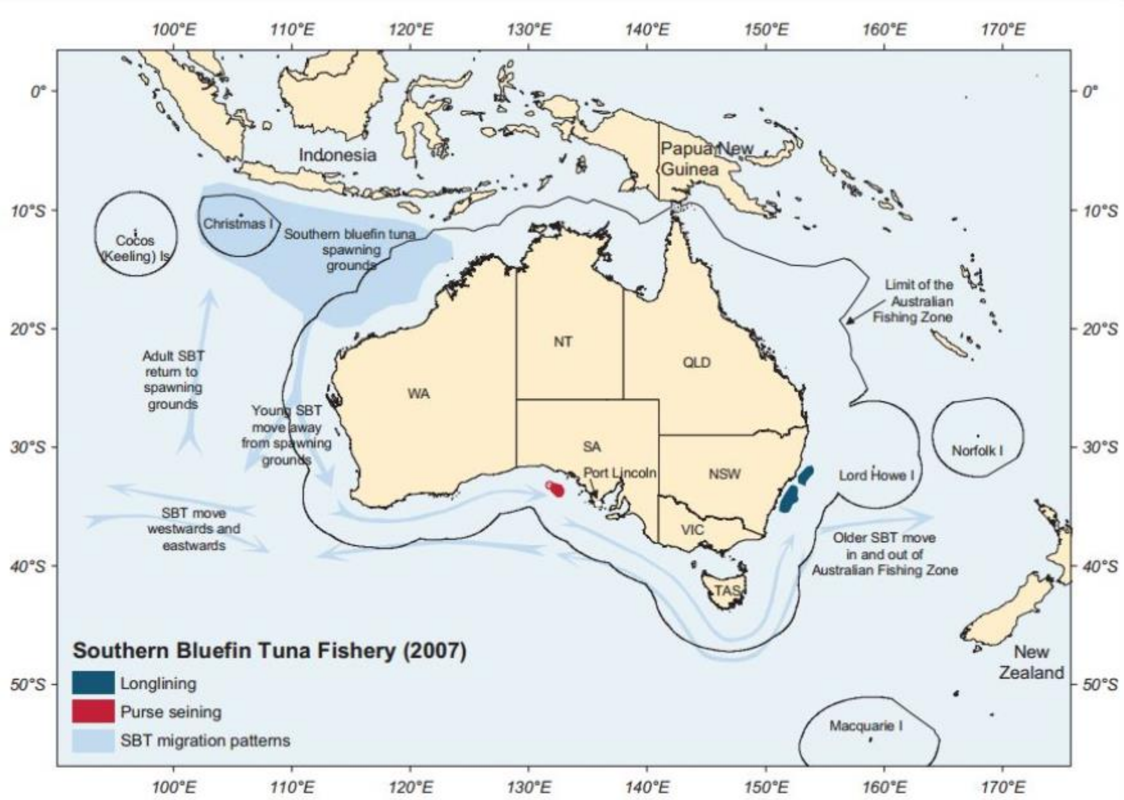
Note: The Eastern dwarf galaxias (*Galaxiella pusilla*), Yarra pygmy perch (*Nannoperca obscura*), and variegated pygmy perch (*Nannoperca variegata*) have been identified within the EPBC Act Protected Matters Report as present within the EMBA, however these species have not been included within this table as they are a freshwater species.

Key: EPBC Act Status: V= Vulnerable, CE= Critically Endangered, CD= Conservation Dependent

4.5.3.1.2 Southern Bluefin Tuna

Southern bluefin tuna are a large pelagic migratory fish of high commercial value. Generally, southern bluefin tuna are found in the southwest and southeast Atlantic Ocean, east and west Indian Ocean, and the southwest Pacific Ocean (Collette *et al.,* 2011). Within Australian waters, southern bluefin tuna occur from north Western Australia, south to South Australia, including TAS waters, and north up Australia's east coast to NSW.

Spawning of southern bluefin tuna occurs from August to April, in warm (>24 °C) surface waters. Only one spawning ground is known, in the Indian Ocean between northern Western Australia and Java (Caton, 1991; Basson *et al*., 2012) (**Figure 17**). It is considered that all southern bluefin tuna belong to a single global population.



Source: AFMA, 2023a

Figure 17 Southern Bluefin Tuna Spawning Grounds and Migration Routes

Southern bluefin tuna migrate down Australia's west coast before passing through the GAB and moving east into the Tasman Sea or west into the Indian Ocean (Basson *et al.,* 2012). During this migration, fish tend to be found in deeper waters seaward of the Continental Shelf but will come in close to shore in locations were deepwater/the shelf is close to shore. Over the summer period (December – April), southern bluefin tuna, of a range of ages and sizes are found to aggregate in large schools near the surface in the coastal waters off the southern coast of Australia, but tend to migrate to spend winters in deeper, temperate oceanic waters (DoEE, 2012).

Tagging studies undertaken on juvenile (1 – 4 years old) southern bluefin tuna revealed juveniles move from spawning grounds south of Indonesia down to the GAB and waters south of Western Australia. The GAB represents the highest preference summer location across the Southern Ocean (Basson *et al*., 2012).

From one year of age, juvenile southern bluefin tuna move south from spawning grounds, with these movements aided by the southward flow of the Leeuwin Current. The young fish are resident along the southwest coast of South Australia throughout the summer months (Fujioka *et al*., 2010), where they generally occur in waters <200 m deep (Hobday *et al*., 2009). As the fish age, they move eastward in summer; however, some fish remain in southern Western Australia waters throughout winter.

At 2 – 4 years old, southern bluefin tuna are common in the GAB during summer months, particularly in waters with a warm (17 – 22 °C) surface layer and a shallow thermocline at 60 – 80 m (Bestley *et al*., 2008). While in the GAB, the young fish aggregate in large schools and spend a large proportion of the day in the upper 100 m of the water column (Bestley *et al*., 2009).

Aerial surveys and spotting data from spotter planes in the commercial tuna fishery have identified the highest densities of southern bluefin tuna occur in a band inside and parallel to the Continental Shelf break, with the location of aggregations varying between years (Hobday *et al*., 2015). While in the GAB, individual tuna have been observed to exhibit short-term school fidelity, suggesting that schools break-up and reform relatively frequently (Willis and Hobday, 2007), and that schooling behaviour is not a serious issue for juvenile tuna (Basson *et al*., 2012).

As surface waters cool and upwelling ceases, the tuna begin to move out of the GAB. 2 – 3-year-old fish carry out annual migrations between GAB summer feeding grounds and winter-feeding grounds in the central and southeast Indian Ocean or Tasman Sea (Basson *et al*., 2012). Most tuna move west from the GAB into the Indian Ocean; a change in preference for this location from the Tasman Sea since the 1990s and 2000s (Basson *et al*., 2012; Evans *et al*., 2017). The findings of Basson *et al*. (2012) on tuna migrations to and from the GAB can be summarised as follows:

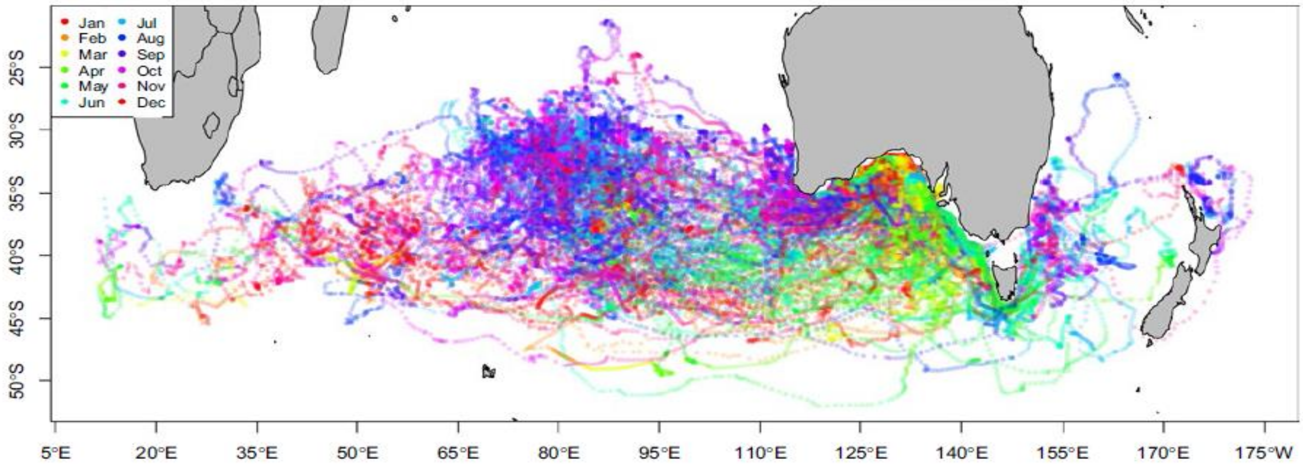
- Summer: juveniles are primarily resident in the GAB and off southern Australia, with fish almost exclusively resident in February and March. The highest level of residency in southern Australia occurs in January through to May. Summer site fidelity is high, with all tagged fish returning to SA in summer;
- Winter: some individuals remain in waters off southern Australia, with most moving to Indian Ocean and Tasman Sea feeding grounds. Tagging data suggests a less strong winter site fidelity, with fish often switching between the Indian Ocean and Tasman Sea foraging grounds in consecutive winters;
- Juvenile southern bluefin tuna migrate throughout the latitudinal band of approximately 30 – 40°S;
- Migrations out of the GAB to winter feeding grounds begin in May and continue to September, with most movements occurring in June to August. Migrations back to GAB summer feeding grounds begins in October and continues through to January, with the majority occurring in November and December;
- Movements out of the GAB is more gradual than the return to the GAB, with fish departing over a wide range of times and moving to a wide range of locations; and
- Juvenile southern bluefin tuna can travel up to 200 km per day when migrating, although they move on average 100 km per day. When resident, juveniles move relatively little longitudinally, but may move up to 70 km per day.

Patterson *et al.* (2018) further states that southern bluefin tuna migrations are unusual in that movement is specific to juveniles and the timing of migrations is highly variable (i.e. not synchronised), with no obvious latitudinal component that could be associated with seasonal temperature, or evidence of a correlation with environmental drivers such as sea surface temperature and surface chlorophyll- α. However, Patterson *et al*. (2018) reports on the movements of 110 tagged juvenile southern bluefin tuna between 1998 and 2011, whereby the juvenile fish within the GAB were associated with low surface productivity, consistent with previous findings of southern bluefin tuna but inconsistent with other bluefin tuna species (e.g Pacific) whose movements tracked seasonal productivity maxima (Boustany *et al.,* 2010; Whitlock *et al*., 2015). Potential explanations for this are:

- Southern bluefin tuna prefer to hunt in clear waters away from areas of high turbidity such as those associated with high primary productivity;
- The energy transfer from primary to intermediate (i.e. tuna prey) levels in the food web involves a time lag, offsetting the presence of apex predators from high levels of primary productivity; and
- Areas of concentrated productivity are likely to operate at smaller spatial scales than those at the scale that tuna residency was investigated.

The distribution of juvenile southern bluefin tuna within the GAB is poorly understood; however, anecdotal evidence and tagging studies has been used to describe seasonal movements throughout the GAB over summer – autumn. These suggest that the smaller, younger southern bluefin tuna (1 – 2 year olds) are more associated with inshore regions in Western Australia (Fukioka *et al*., 2010), with older fish (2 – 4 year olds) more abundant in central regions of the GAB close to the shelf break (**Figure 19**) (Eveson and Farley, 2016; Evans *et al.,* 2017a).

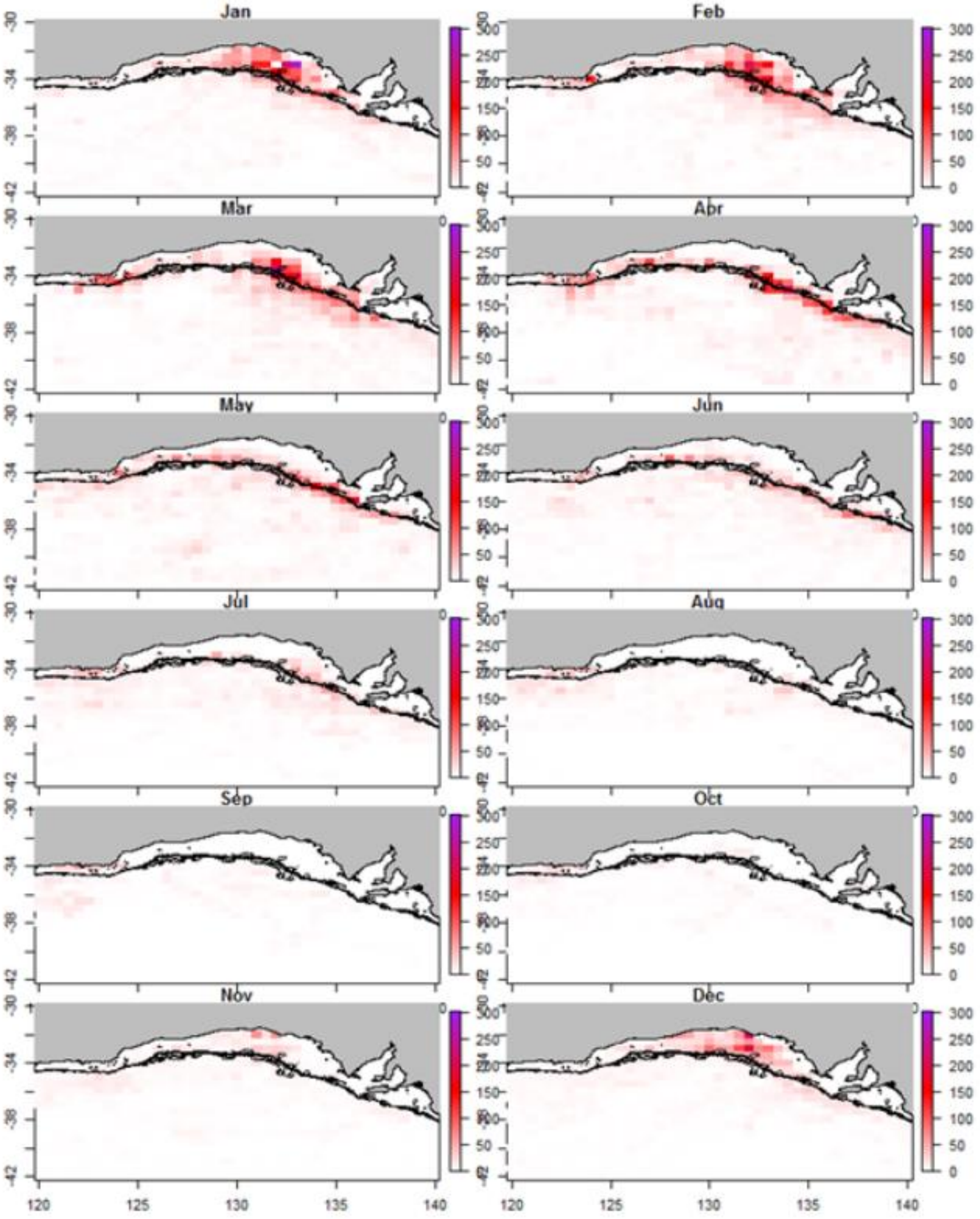
Peak periods in juvenile southern bluefin tuna residency within the GAB broadly coincides with the high abundance of Australian sardines/pilchards (*Sardinops sagax*) (Ward *et al*., 2006a; Itoh *et al*., 2011), suggesting juveniles move to waters of the GAB following the high density of prey.



Source: Patterson *et al*., 2018

Figure 18 Estimated Movements of Juvenile Southern Bluefin Tuna (coloured by month) Derived from Deployments of Archival Tags 1998 - 2011

Source: Patterson *et al*., 2018



Source: Evans *et al*., 2017a

Figure 19 Monthly Aggregated Counts of Position Estimates Derived from Juvenile Southern Bluefin Tuna Tagged with Archival Tags 1998 – 2011 Including Bathymetric Contour Lines Associated with Shelf Breaks (black)

Southern bluefin tuna continue to undertake the above-described seasonal migrations until they reach approximately five years of age, after which they disperse throughout waters in the Pacific, Indian and Atlantic Oceans (Hobday *et al.,* 2015) during winter, before migrating to spawning grounds from spring to autumn (Caton, 1991). Adults present in the Tasman Sea move south into waters around TAS in the end of spring/beginning of summer. Following this, they move south of Australia, then north up the Western Australia coastline towards spawning grounds (**Figure 20**). Tagged sub-adult and adult southern bluefin tuna caught in the Tasman Sea demonstrate temperature preferences for waters 18 – 20 C and depths <250 m, although depths >600 m are also utilised (Patterson *et al*., 2008). Adult movements are relatively fast and direct, lasting approximately 110 days (Hobday *et al*., 2015). Based on the tracks of tagged adult southern bluefin tuna depicted in **Figure 20**, adults may be present in the OA from October to December (Patterson *et al*., 2015).

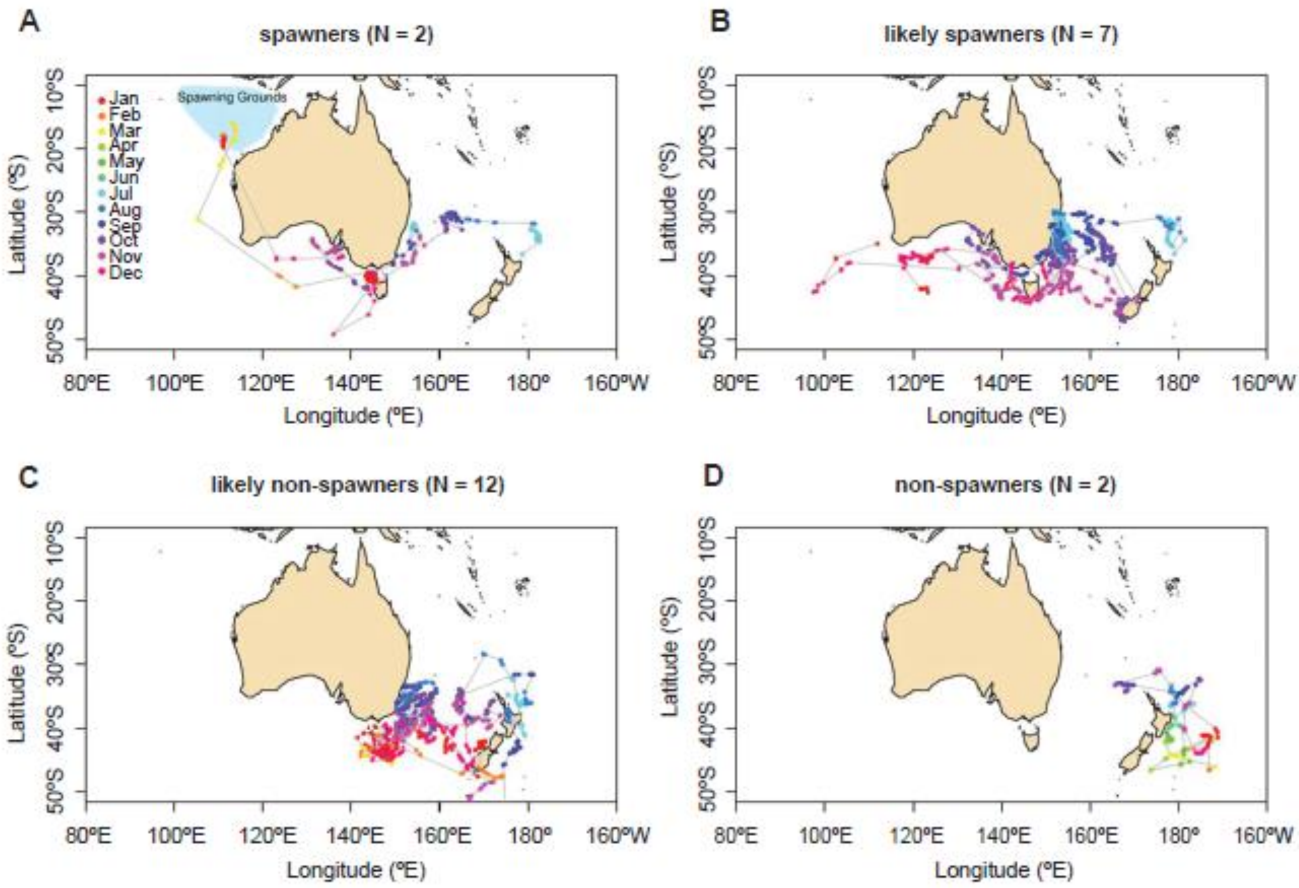


Figure 20 Movements of Adult Southern Bluefin Tuna Categorised by Putative Spawning Behaviour

Source: Hobday *et al.,* 2015

Key: (A) spawners showing movements from the tagging region to the spawning grounds (defined in blue); (B) likely spawners which made large westward migrations; (C) likely non-spawners remained in the Tasman Sea region until late in the spawning season and (D) non-spawners which remained resident in the Tasman for a full spawning cycle.

4.5.3.2 Commercially Targeted Fish Stocks

The SEMR provides fishing grounds for several commercial fisheries which target a variety of pelagic and demersal fish species. The stock assessments of commercially targeted species likely to be captured within, or directly adjacent to the OA, are provided in **Table 21**. This includes reproduction and recruitment strategies and spawning seasons of each species as well as their distribution and habitat. Stock assessments have been included from the VIC, South Australia, TAS and Commonwealth commercial fisheries.

Table 21 Stock Assessment of Commercially Targeted Species Likely to be Captured Within or Directly Adjacent to the OA

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Australian herring *Arripis georgianus*	Western Australia – NSW Bays and estuaries, rocky reefs, seaweed	1 – 5	Partial spawners 100,000 eggs on average Planktonic eggs and larvae	N/A	Sustainable	N/A	N/A	May – June in Western Australia
Barracouta *Thyrsites atun*	Midwest Western Australia – QLD, around TAS Open water, coastal bays	0 – 550	Eggs are pelagic Juveniles inhabit sheltered waters of southern bays and estuaries.	N/A	N/A	Undefined	N/A	October – March in TAS (spawning ground for all southern stock)
Bigeye ocean perch *Helicolenus barathri*	South-eastern Australia Continental shelf and slope	200 – 700	Maturity at 5 – 7 years Lecithotrophic viviparous (fertilisation and larval development is internal) 150,000 – 200,000 eggs	N/A	N/A	N/A	Sustainable	June – February
Bight redfish *Centroberyx gerrardi*	Bass Strait – Western Australia Rocky reefs and muddy substrates.	< 500	Maturity at 9 years Low fecundity but multiple occasions over season	N/A	Sustainable	N/A	N/A	Summer – autumn
Blacklip abalone *Haliotis rubra rubra*	State-wide	0 – 25	Dioecious broadcast spawners Larvae are lecithotrophic and pelagic Short larval phase: 5 – 15 days and dependent on water temperature. Local recruitment	Sustainable	Sustainable	Sustainable	N/A	Spring – autumn with peaks in late Summer and early Spring
Blue grenadier *Macruronus novaezelandia*	GAB and off VIC and TAS. Continental slope, juveniles in shallower bays. Move up the water column at night.	200 – 700	Maturity at 4 – 7 years. 1 million eggs in one spawning event. Main spawning ground in off the west coast of TAS	N/A	N/A	N/A	Sustainable	Winter – early spring

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Blue mackerel *Scomber australasicus*	Bass Strait – Western Australia Schooling pelagic species. Juveniles inhabit shallower bays	<200	Maturity at 3 years. Serial spawners (multiple events over season) Release ~70,000 eggs per event.	N/A	Sustainable	N/A	N/A	Spring – summer off NSW and QLD
Blue morwong *Nemadactylus valenciennesi*	Southern coastal waters of Australia's mainland Reef-associated	3 – 240	Gonochorists (remain same sex) lengthy pelagic larval phase	N/A	N/A	N/A	Depleting	Unknown
Blue warehou *Seriolella brama*	NSW – South Australia, TAS and New Zealand Inshore reefs/harbours as juveniles. Adults inhabit continental shelf and slopes. Schooling fish near seabed.	50 – 400	Maturity at 3 years. Spawn 3 times a season (430,000 – 1,350,000 eggs per event). Larvae restricted to shelf and slope waters. Main spawning grounds off western VIC and TAS	N/A	N/A	Depleted	Depleted	Winter – early spring.
Blue-eye trevalla *Hyperoglyphe Antarctica*	South to eastern coastlines Rocky ground on continental slope, juveniles in surface waters associated with debris. Move up the water column at night	200 – 900	Maturity at 11 – 12 (females) or 8 – 9 (males). Eggs released in 3 – 4 batches (2 – 11 million eggs per season)	N/A	N/A	N/A	Sustainable	Summer – autumn off central NSW to north-east TAS

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Bluethroat wrasse *Notolabrus tetricus*	State-wide coastal waters Territorial, inhabiting rocky reefs.	<30	Single male with 'harem' of females Maturity at 4 – 8 years High degree of site fidelity once settled Extensive larval dispersal Planktonic larval duration: 44 to 66 days Protogynous hermaphrodite	Sustainable	Sustainable	Sustainable	N/A	Spring
Bronze whaler *Carcharhinus brachyurus*	NSW – Geraldton in Western Australia. Found on continental margins, sometimes large bays. Migratory within range. North: spring – summer, South: autumn – winter	0 – 360	Viviparous, 7 – 10 pups a season. Distinct pairing with embrace.	Undefined	N/A	N/A	N/A	Occur all year but peaks in summer
Commercial Scallop *Pecten fumatus*	TAS – VIC Muddy – coarse sandy seafloor Mainly sedentary	10 – 120	Maturity at 1 year Spawn in second year. Hermaphrodites Broadcast spawners Fecundity increases with size and age	N/A	N/A	N/A	Sustainable	Winter – spring triggered by increase in water temperature
Common jack mackerel *Trachurus declivis*	Western TAS to southern Western Australia. Pelagic schooling fish in waters off continental shelf	20 – 300	Maturity at 3 – 4 years Spawning begins of southeast coast of Australia and progresses southwards. Serial spawners (34,000 eggs per event).	N/A	N/A	N/A	Sustainable	Spring – summer

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Deepwater flathead *Platycephalus conatus*	West TAS through GAB Demersal fish on continental shelf and slope. Buried in sand or mud.	70 – 490	Maturity at 5 – 6 years (females) or 4 – 5 year (males). Aggregate for spawning. 0.5 – 3.5 million eggs per season	N/A	N/A	N/A	Sustainable	Late spring – autumn
East Australian salmon *Arripus trutta*	TAS - QLD Open water, sandy seabeds.	<30	Pelagic spawners Planktonic phase for eggs, larvae and juveniles. Juveniles appear in shallow Tasmanian waters between January and September.	NA	NA	Sustainable	NA	October to March, off NSW
Elephantfish *Callorhinchus milii*	Southern Australia and NZ Shallow bays and estuaries as juveniles, move deeper as adults.	<200	Maturity at 4 – 5 years (females) or 3 years (males). Oviparous Eggs deposited in sand/mud near river mouths. Hatch after 8 months	N/A	N/A	N/A	Sustainable	February
Gemfish *Rexea solandri*	West edge of Bass Strait through GAB Bottom dwelling schooling fish. Juveniles are pelagic.	100 – 800	Maturity at 4 – 6 years (female) or 3 – 5 years (male). Spawning dynamics not known for western stock.	N/A	N/A	N/A	Sustainable	summer
Giant crab *Pseudocarcinus gigas*	WA – TAS Seaweed, reef, sand habitats	110 – 400 (core range)	Planktonic larval duration: ~50 days Larval release occurring along the edge of the continental shelf Highly fecund Females store sperm for successful breeding seasons	Sustainable	Sustainable	Depleted	N/A	Autumn - spring

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Gould's squid *Nototodarus gouldi*	Southern QLD – mid-Western Australia and TAS Open water. Coastal, inner shelf and shelf break	< 600	Spawns once and then die Egg mass are free-floating gelatinous sphere and contains several thousands of eggs Highly variable recruitment	N/A	N/A	Sustainable	Sustainable	Year-round
Greenlip abalone *H. laevigata*	Southern mainland and TAS Rocky reefs	< 40	Maturity at 2 years. Dioecious broadcast spawners Larvae are lecithotrophic and pelagic Local recruitment	N/A	Depleting	Depleting	N/A	Spring – autumn with peaks in late summer and early spring
Gummy shark *Mustelus antarcticus*	State-wide, inshore coastal waters Demersal species on or near seabed on continental shelf	80 – 350	Maturity at 4 – 5 years. Low fecundity (an average of 14 pups per breeding cycle) and an 11 to 12 month gestation period.	Sustainable	Sustainable	N/A	Sustainable	November to December in shallow coastal waters
Hapuku Commonwealth *Polyprion oxygeneios*	Southern waters, Western Australia – NZ Rough ground on continental shelf. Juveniles pelagic with drifting weed	50 – 850	Extended larval/juvenile phase (years) Primary gonochrists.	N/A	N/A	N/A	Undefined	June - August
Jackass morwong *Nemadactylus macropterus*	Tasmania through GAB Demersal species near continental shelf and slope. Juveniles near shallow reefs.	10 – 400	Maturity at 3 years. Multiple spawning events Extended pelagic post larval phase ('paperfish') for 9 – 12 months	N/A	N/A	N/A	Sustainable	Late summer - autumn

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
John dory *Zeus faber*	Coastal and continental-shelf waters around most of Australia Demersal species, open sand, mud, rocky grounds and reefs	5 – 360	Maturity at 3 – 5 years. Multiple spawning events a season Fecundity increases with body size	N/A	N/A	N/A	Sustainable	Summer – autumn in NSW
King George whiting *Sillaginodes punctatus*	Southeast Australia Seagrass and sandy habitats. Deeper waters as they get older	2 – 200	High Fecundity Moderate growth rate Offshore spawning and long larval dispersal Serial batch spawners	Sustainable	Sustainable	N/A	N/A	April - June
Maori octopus *Macroctopus maorum*	Southeastern Australia Rocky reefs, crevasses	0 – 549	Eggs incubate benthically with maternal protection Larvae enter a planktonic phase with relatively high dispersal potential	Sustainable	N/A	N/A	N/A	Undefined
Mirror dory *Zenopsis nebulosus*	Throughout southern Pacific and southern Australia Near seabed, solitary species	50 – 600 m	Maturity at 5 years Low fecundity Possible serial spawners	N/A	N/A	N/A	Sustainable	Winter in NSW
Ocean jacket *Nelusetta ayraudi*	Southern Australia Juveniles inhabit estuaries and sheltered bays with sea grass. Adults inhabit rocky reefs, sandy-mud bottoms, sponge-algae gardens.	2 – 250	Maturity at 2.5 years Spawning aggregations at 85 – 200 m Broadcast spawners with no parental egg care	N/A	N/A	N/A	Sustainable	3-month period Peaks in autumn (South Australia) or late winter (NSW)

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Orange roughy *Hoplostethus atlanticus*	West TAS – south-east South Australia Steep continental slope and ridges, rough bottoms. Sedentary species but can aggregate	700 – 1400	Maturity at 27 – 32 years. Spawn over 1 – 2 weeks. Low fecundity. Eggs float to surface then sink to hatch 10 – 20 days later.	N/A	N/A	N/A	Depleted	Mid July – late August.
Pale octopus *Octopus pallidus*	GAB – TAS – southern NSW Soft sediment habitats	< 600	Semelparous (spawn once then die) Few (450 – 800) very large eggs No larval phase after hatching with hatchlings resembling adults in both appearance and behaviour Limited dispersal	NA	NA	Depleting	NA	Spawns year-round with peaks in late summer/early autumn
Pink ling *Genypterus blacodes*	South-eastern coastline of Australia. Continental shelf and slope, rock ground to soft sand/mud	20 – 1000	Maturity at 7 – 12 years. Serial spawners Egg batches make floating mass	N/A	N/A	N/A	Sustainable	Late winter - spring
Pipi *Donax deltoides*	State-wide but 2 stocks at either end of Bass Strait	2 – 10	Recruits are likely to be self-seeded Highly fecund Widely dispersed in the larval stage.	Sustainable	N/A	N/A	N/A	Year-round
Purple wrasse *N. fucicola*	Territorial, inhabiting rocky reefs	1 – 90	Single male with 'harem' of females Maturity at 3 years Highly fecund, gonochoristic species Planktonic larval duration: 40 to 87 days	Sustainable	N/A	Sustainable	N/A	Spring

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Ribaldo *Mora moro*	Rough seabeds and seamounts on the continental shelf of south-eastern Australia.	450 – 2,500	Maturity at 14 years (females) or 8 years (males) Juveniles may be pelagic	N/A	N/A	N/A	Sustainable	Winter - spring
Sawsharks *Pristiophorus spp.*	Southern and south-eastern coasts of Australia but are mainly caught in Bass Strait.	< 600	Maturity at 2 years. Aplacental viviparous with 12-month gestation. 5 – 10 pups per litter, breed every second year.	N/A	N/A	N/A	Sustainable	Winter
School shark *Galeorhinus galeus*	Southern coast of Australia Continental shelf and slope, migrating up to 1400 km long southern coast. Move up water column at night	< 550	Maturity at 10 years (females) or 8 years (males) Ovoviviparous with gestation of 12 months. 15 - 43 pups born every 2 – 3 years in shallow bays	N/A	Depleted	N/A	N/A	Early summer
Silver trevallies *Pseudocaranx georgianus, P. wrighti*	Southern temperate Australia Schooling species in estuarine and coastal waters. Open ground, sand/gravel bottoms	10 – 230	Maturity at 2 – 4 years. Spawning in estuaries and deep waters Serial spawners Low fecundity	N/A	N/A	N/A	Sustainable	Spring - autumn
Silver warehou *Seriolella punctata*	Southern and eastern Australia Continental shelf and slope as adults, juveniles occur in bays and inlets. Schooling species	50 – 600	Maturity at 4 years. High fecundity. Spawning timing varies with location	N/A	N/A	N/A	Sustainable	Late winter – early spring

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Snapper *Chrysophrys auratus*	VIC – Investigator Strait, South Australia Adults associated with deeper offshore reefs, juveniles enter bays and estuaries.	1 – 200	Mature at 2 – 7 years High fecundity Serial spawners	Sustainable	N/A	N/A	N/A	When water temperature is 18°C
Southern bluefin tuna *Thunnus maccoyii*	Global Temperate Oceans Juveniles often closer to shore	< 500	Maturity at 11 – 12 years High fecundity (14 – 15 million eggs per season). Migrate south after spawning Juveniles typically migrate through the GAB heading east between December and April	N/A	N/A	N/A	Recovering	Spring – summer in North-east Indian Ocean
Southern Garfish *Hyporhamphus melanochir*	Lancelin, Western Australia – Southern NSW and TAS Schooling fish on seagrass. Near surface at night.	0 – 40	Serial spawner Asynchronous oocyte development	N/A	Sustainable	N/A	N/A	October – March
Southern rock lobster *Jasus edwardsii*	Southern Australia Rocky reefs and crevices	<150	Extensive and protracted pelagic larval dispersal phase - 12–18 months Site attached once settled	Sustainable	Sustainable	Sustainable	N/A	April – July
Southern sand flathead *Platycephalus bassensis*	Endemic to temperate Australian coastal waters and other bays and inlets. Sandy bottoms	0 – 100	Multiple spawning events per season Variability in egg release patterns.	Sustainable	Undefined	N/A	N/A	October – March

Species	Distribution and habitat	Depth range (m)	Reproduction and Recruitment	VIA	SA	TAS	Comm.	Spawning season
Striped trumpeter *Latris lineata*	Sydney, NSW – southern Western Australia, TAS and New Zealand Exposed reefs and rocky bottom	300	Multiple spawners, Highly fecund (100,000 to 400,000 eggs Small pelagic eggs Extended larval phase of: 9 months No information on size and timing of settlement	N/A	N/A	Recovering	N/A	July – early October
Tiger flathead *Platycephalus richardsoni*	Endemic to south east of Australia Mud or sandy bottoms. Juveniles inhabit shallower waters	10 – 400	Maturity at 3 – 5 years Variation in spawning with location. High fecundity Mature with migrate to shallow waters for spawning	N/A	N/A	N/A	Sustainable	Spring – autumn
Western Australian salmon *Arripis truttaceus*	Shark Bay, Western Australia – VIC and TAS Juveniles inhabit soft substrates and coastal waters. Adults form schools in reefs and open water	0 – 30	Maturity at 3–5 years Spawn in south-west WA Nursery grounds in South Australia, VIS and TAS	Sustainable	N/A	N/A	N/A	April – May (migration to Western Australian waters)
Yelloweye mullet *Aldrichetta forsteri*	Mid Western Australia – NSW and TAS Nearshore and estuaries	0 – 10	Gonochristic Spawning occurs in estuaries Low fecundity Pelagic egg development.	N/A	Sustainable	N/A	N/A	March – August
Yellowtail kingfish *Seriola lalandi*	Temperate waters of Atlantic, Pacific and Indian Oceans Rocky reefs and adjacent areas	> 300	Maturity at 5 -7 years External fertilisation Rapid growth of larvae and juveniles (2 – 3 kg in first year)	N/A	N/A	N/A	Sustainable	Spring – summer

4.5.3.3 Elasmobranchs

4.5.3.3.1 Elasmobranch Listed Threatened and Migratory Species

11 threatened and/or migratory elasmobranch species were identified within the EPBC Act Protected Matters Report as potentially occurring in the OA and/or the wider EMBA. A description of the threatened and/or migratory elasmobranchs identified in the EPBC Act Protected Matters Report is provided in **Table 22**.

Table 22 EPBC Act List of Threatened and Migratory Elasmobranchs Identified within the OA and/or EMBA

Species	EPBC Act Status/ Migratory Status	Description of species and potential to occur within the OA and EMBA
White Shark *Carcharodon carcharias*	V M	White sharks are a large (grow to a minimum length of 6 m and can weigh up to 3,000 kg (Mollet and Cailliet, 1996; Last and Stevens, 2009)) circum-globally distributed marine apex predator that inhabits temperate and sub-tropical waters (Compagno, 2001). Perceived worldwide declines in white shark populations have resulted in protection of the species. In Australia, white sharks are broadly distributed throughout southern waters from North West Cape, Western Australia to southern Queensland (Last and Stevens, 2009). There are two sub-populations of white sharks in Australian waters: the eastern (NSW, VIC, TAS, Queensland and New Zealand) and the southern-western (South Australia, Western Australia, and western-Vic). The OA is within the known distribution of the southern-western population (Department of Primary Industries and Regional Development (DPIRD) n.d.). Accurate population assessments are not yet possible for any region (Bruce, 2008). Satellite tagging studies of white sharks in Australia have indicated that most movement patterns are restricted to coastal, continental shelf or slope waters (Bradford *et al*., 2020). In inshore waters, white sharks are commonly found in the vicinity of islands, and often surrounding fur seal and Australian sea lion colonies. Bradford *et al*. (2020) documented satellite tracked movement of white sharks, with females covering a broader longitudinal range than males, with an average track length of approximately 3,630 ± 750 km for females and approximately 2,525 ± 457 km for males. Key locations for white sharks include Wilsons Promontory, VIC (particularly juveniles) and the Neptune Islands off the Eyre Peninsula, SA (CoA, 2013a). The OA overlaps with the known distribution of white sharks. There are four white shark BIAs that overlap with the OA, and an additional breeding (nursery area) BIA and two foraging BIA which also overlap with the EMBA (285 km, 15 km, and 375 km from the OA respectively) (see **Figure 21**). Given the wide-ranging distribution of this species, and identification of several BIAs within the OA and EMBA, white sharks are likely to be encountered during the Otway Basin 3D MC MSS. **Relevant management plan**: Recovery Plan for the White Shark (*Carcharodon carcharias*). The overarching objective of the 10 specific objectives of the white shark recovery plan is to assist the recovery of the white shark in the wild, throughout its range in Australian waters, with a view to: 1) improving population status, leading to future removal of the white shark from the threatened species list of the EPBC Act, and 2) ensuring that anthropogenic activities do not hinder the recovery of the white shark in the near future, or impact on the long term conservation status of the species. **Key threats**: 1) Mortality related to incidental (accidental or illegal) capture by commercial and recreational fisheries, including issues of post release mortality; 2) Mortality related to shark control activities such as beach meshing or drumlining (east coast population). Exposure to underwater noise is not identified as a threat to the recovery of the species.

Species	EPBC Act Status/ Migratory Status	Description of species and potential to occur within the OA and EMBA
Little gulper shark *Centrophorus zeehaani*	CD N/A	Little gulper sharks are small, deepwater sharks that are endemic to Australian waters. This species inhabits the upper slope between 180 m and 900 m (Williams *et al*., 2012) of the southern Continental Shelf. Little gulper shark is found off the southern Australian coast from near Warrnambool to south of Ceduna and from the western side of the GAB up the west coast to Mandurah. It is absent off southern TAS through Bass Strait (Williams *et al.,* 2012). The species is mainly demersal with a depth range of 190 – 900 m and a core range of 200 – 800 m (Williams *et al*., 2012). **Relevant management plan**: No adopted EPBC documented recovery plan for little gulper shark, however, a Listing Advice is in effect from 14 March 2013. **Key threats**: The main threat to the little gulper shark is population reduction caused by past fishing pressure in state and Commonwealth-managed commercial fisheries operating on the upper-slope.
School shark *Galeorhinus galeus*	CD N/A	School sharks occur globally in temperate waters. They are mostly found in demersal waters over the Continental and insular shelves, but also occur over the upper slopes, in depths from near-shore to 550 m (Last and Stevens, 1994). Inshore areas are particularly important as birthing and nursery areas (TSSC, 2009). **Relevant management plan**: No adopted EPBC documented recovery plan for school shark, however, a Listing Advice is in effect from 22 January 2009. **Key threats**: The main threat to the school shark is fishing pressure (both in Australia and globally) across its range and at nursery areas as well as habitat degradation at nursery areas (often located in inshore bays and estuaries).
Grey nurse shark (east coast population) *Carcharias taurus*	CE N/A	Grey nurse sharks in Australia are restricted to two populations: the east coast from southern QLD to northern NSW, and around the south-west coast of Western Australia. Due to the decline in numbers of the east coast population, this population is now listed as Critically Endangered. This species is uncommon in VIC, South Australian, and TAS waters, and has not been found in the GAB (Pogonoski *et al*., 2002), therefore is it unlikely to be encountered during the Otway Basin 3D MC MSS. However, a foraging and migration BIA for this species overlaps with the EMBA (**Figure 21**) and is therefore relevant to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: Recovery Plan for the Grey Nurse Shark (Carcharias taurus) (DoE, 2014). The overarching objective of this recovery plan is to assist the recovery of the grey nurse shark in the wild, throughout its range in Australian waters with a view to: 1) improving the population status, leading to future removal of the grey nurse shark from the threatened species list of the EPBC Act; and 2) ensuring that anthropogenic activities do not hinder the recovery of the grey nurse shark in the near future, or impact on the conservation status of the species in the future. **Key threats**: The main threats to the grey nurse shark (east coast population) are mortality related to incidental capture by commercial and recreational fisheries, and mortality related to shark control activities such as beach meshing or drumlining. Other potential threats to the species include impacts from ecotourism, collection for public aquaria, pollution and disease and ecosystem effects because of habitat modification and climate change.

Species	EPBC Act Status/ Migratory Status	Description of species and potential to occur within the OA and EMBA
Harrison's dogfish *Centrophorus harrissoni*	CD N/A	Harrison's dogfish is a small, deepwater shark with a core range that is continuous from north of Evans Head in NSW through waters off the coast of VIC, to Cape Hauy in TAS. It is not known from South Australian waters (Williams *et al*., 2012). This species is largely demersal and has been recorded in water depths between 100 m (Williams *et al.,* 2012) and 1050 m (Daley *et al.,* 2002), with a core depth range of 200 – 900 m (Williams *et al*., 2012). Due to the likely distribution of Harrion's dogfish being far from the OA, it is unlikely this species will be affected by activities associated with the Otway Basin 3D MC MSS, but is of relevance to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: No adopted EPBC documented recovery plan for Harrison's dogfish, however, a Listing Advice is in effect from 14 June 2013. **Key threats**: The main threat to this species is past fishing pressure in both state and Commonwealth-managed commercial fisheries operating on the upper-slope.
Maugean skate *Zearaja maugeana*	E N/A	The Maugean skate inhabits two small estuarine systems in southwest TAS; Macquarie Harbour and Bathurst Harbour. Within these harbours, Maugean skate inhabit low-nutrient brackish water, 5 – 7 m deep. The total range of this species is thought to be no more than 100 km^2, and the population is estimated at 1,000 individuals (TSSC, 2004). Due to highly restricted distribution of this species, this species will not be affected by activities associated with the Otway Basin 3D MC MSS but is of relevance to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: No adopted EPBC documented recovery plan for Maugean skate, however, a Listing Advice is in effect from 4 March 2004 and an Approved Conservation Advice is in effect from 3 July 2008. **Key threats**: The main potential threats to this species are trace metal pollution from historic mining operations in Macquarie Harbour, incidental capture in fishing activities, the introduction of non-native marine species, changes to water nutrient levels through discharge from cruise ships and fishing vessels, and an increase in tourism pressure. .

Species	EPBC Act Status/ Migratory Status	Description of species and potential to occur within the OA and EMBA
Whale Shark *Rhincodon typus*	V M	Whale sharks are the largest known living fish species, reaching up to 12 m in length, although more commonly measuring 4 – 10 m (Colman, 1997). They are an oceanic and coastal, tropical to warm-temperate pelagic species that is generally encountered close to or at the surface but can make dives to around 1000 m in search of prey (Compagno, 1984). In Australia, the Whale Shark is most seen in waters off northern Western Australia, the Northern Territory and QLD, with occasional observations in VIC and South Australia (Compagno, 1984; Last and Stevens, 1994). Individuals are unlikely to be present in the OA and therefore will not be affected by routine activities associated with the Otway Basin 3D MC MSS, however, they are of relevance to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: No adopted EPBC documented recovery plan for whale shark. A Whale Shark Recovery Plan 2005-2010 is provided on the federal register of legislative instruments. The objective of the whale shark recovery plan 2005-2010 is to maintain existing levels of protection for the whale shark in Australia while working to increase the level of protection afforded to the whale shark within the Indian Ocean and Southeast Asian region to enable population growth so that the species can be removed from the threatened species list of the EPBC Act. **Key threats**: The main threat to the whale shark occurs outside Australian waters and is commercial harvesting by other range states of the whale shark. The potential future threats to whale sharks visiting Australian waters are competition with fisheries, habitat damage, pollution and marine debris, climatic and ocean change, predation, disease, and direct disturbance from tourism, research, or interference. At present none of these potential threats appear to have an impact on the numbers of whale sharks visiting Australian waters. Underwater noise is not specifically listed as a threat to the species in the Whale Shark Recovery Plan 2005-2010. Sound from commercial vessels has been identified to disturb whale sharks (DpaW, 2013).
Shortfin mako shark *Lsurus oxyrinchu*	N/A M	The shortfin mako is a large (up to 4 m length) and fast (up to 18.8 ms^{-1}) pelagic mackerel shark (Last and Stevens, 2009) that has a circum-global distribution. Shortfin mako are highly migratory and inhabits tropical and temperate waters to depths of 888 m, although they are rarely encountered in waters with temperatures less than 16 °C (Rigby *et al.*, 2019a). It is widespread in Australian waters having been recorded in offshore waters all around the continent's coastline (Last and Stevens, 2009). There are no BIAs recognised for shortfin mako in either the OA or wider EMBA; however, given the wide-ranging distribution of this species, and the known site fidelity to areas either side of the OA, shortfin mako are likely to be encountered during the Otway Basin 3D MC MSS. **Relevant management plan**: There is currently no adopted EPBC documented recovery plan for shortfin mako. **Key threats**: Globally, the main threat to the shortfin mako is historic and ongoing fishing pressure.

Species	EPBC Act Status/ Migratory Status	Description of species and potential to occur within the OA and EMBA
Porbeagle *Lamna nasus*	N/A M	The porbeagle primarily inhabits oceanic waters and areas around the Continental Shelf, using a broad vertical range of the water column to depths of 1,809 m (Rigby *et al*., 2019b). Porbeagles are known to undertake seasonal migrations, the movements and timing of which is not well understood (Saunders *et al*., 2011). Individuals have been tracked to cover distances of 1,500 – 1,800 km along continental shelves and crossing the Atlantic Ocean between Europe and North America (Francis *et al*., 2002). Large distance migrations are thought to be due to searching for better feeding environments or for mates (Saunders *et al*., 2011). In Australia, the porbeagle occurs in waters from southern Queensland to south-west Australia (DoE, 2023). Given the wide-ranging distribution of this species, porbeagle sharks may be encountered during the Otway Basin 3D MC MSS. **Relevant management plan:** There is currently no adopted EPBC documented recovery plan for shortfin mako. **Key threats:** Globally, the main threat to the porbeagle is overfishing.
Oceanic whitetip shark *Carcharhinus longimanus*	N/A M	The oceanic whitetip shark is a deep-water pelagic species inhabiting tropical to warm-temperate waters (Compagno, 1984). Oceanic whitetip sharks prefer water temperatures above 20 °C and can reach depths of >180 m (Castro *et al.*, 1999). Within Australian waters, the oceanic whitetip shark is found from WA, through parts of the NT and down to Sydney (Last and Stevens 2009). Given the species distribution is a considerable distance from the OA on the east coast, oceanic whitetip sharks are unlikely to be encountered during the Otway Basin 3D MC MSS. This species is however of relevance to unplanned activities associated with a fuel oil spill (**Section 8.3**). **Relevant management plan**: No adopted EPBC documented recovery plan for oceanic whitetip shark
Giant manta ray *Manta birostris*	N/A M	The giant manta ray has a circum-tropical and semi-temperate distribution throughout the world's major oceans. Within this broad range, populations appear to be sparsely distributed and highly fragmented (Marshall *et al.*, 2018a). The giant manta ray appears to be a seasonal visitor to coastal or offshore sites and are capable of large-scale movements of >1,000 km (Kashiwagi *et al.*, 2011). Whilst largely solitary, giant mantas can aggregate in large numbers to feed, mate or clean. The giant manta ray has a widespread distribution along the coast of Australia and is also known to seasonally migrate between aggregation sites (Marshall *et al.*, 2018b). Given the species wide-distribution, this species is unlikely to be encountered during the Otway Basin 3D MC MSS but may be present in higher numbers in the coastal region of the EMBA. **Relevant management plan**: No adopted EPBC documented recovery plan for giant manta ray.

Note: EPBC Act Status: V= Vulnerable, CE= Critically Endangered, CD= Conservation Dependent, E=- Endangered, M= Migratory

4.5.3.3.2 Elasmobranch Biologically Important Area

Elasmobranch BIAs of relevance to the OA and EMBA include distribution (distribution, distribution (low density), and known distribution), foraging, and breeding (nursery area) BIAs for white sharks and foraging and migration BIAs for nurse sharks. These BIAs are depicted in **Figure 21**, and further described in **Table 23**.

Table 23 Elasmobranch BIAs of Relevance to the OA and EMBA

Species	BIA	Location	Distance to OA
White shark	Breeding (nursery area)	Corner Inlet	285 km from OA
	Distribution	Between the 60 – 120 m depth contour	Overlaps OA
		Between the 120 – 1,000 m depth contour	Overlaps OA
	Distribution (low density)	Australian waters from Barrow Island/Montebello Islands, Western Australia to Yeppoon/Swains Reef QLD	Overlaps OA
	Foraging	Waters off pinniped colonies throughout the SEMR	15 km from OA
		Waters off pinniped colonies throughout the SWMR	375 km from OA
	Known distribution	Coastal/shelf/upper slope waters out to 1,000 m depth contour	Overlaps OA
Grey nurse shark	Foraging	Off the coast of Eden	650 km from OA
	Migration	Off the coast of Eden	663 km from OA
		From south of Brooms Head to the south of Bermagui	707 km from OA

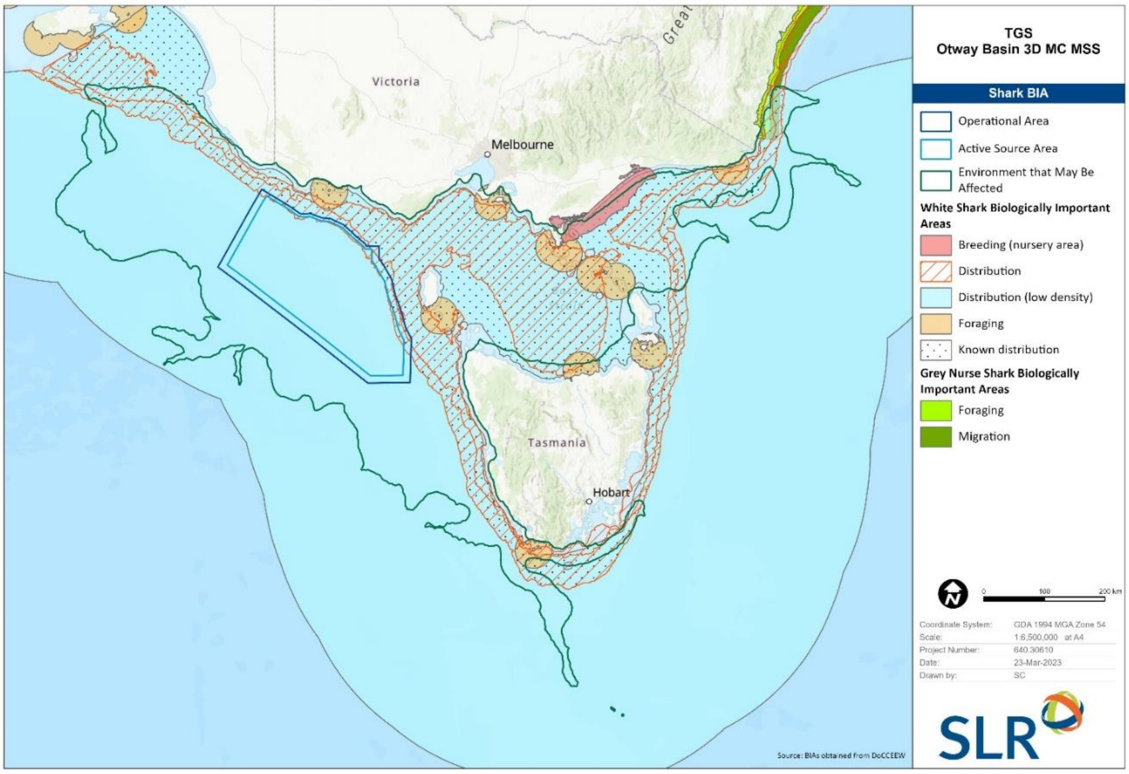


Figure 21 White Shark and Grey Nurse Shark BIAs of Relevance to the OA and EMBA

4.5.4 Cephalopods

All cephalopods consist of a mantle, head, and eight arms (and two long tentacles in the case of some squid). This class of animals includes cuttlefish, squid, octopus, and nautilus. Cephalopods are highly significant ecologically within the marine environment, both as top-level predators and as prey for numerous vertebrates, including fish, seals, cetaceans, and seabirds. Cephalopods, particularly squid, are an important food source for many fish, bird, elasmobranch and marine mammal species that inhabit the OA.

No cephalopod species are included in the EPBC Act List of Threatened Fauna (i.e. identified within the EPBC Act Protected Matters Report); however, according to the Atlas of Living Australia (ALA, 2023), 17 species of cephalopods have been recorded within OA according to Atlas of Living Australia field guide, download generated 28 March 2023 (**Appendix E**). These include various species of squid, octopus and cuttlefish. An additional 92 species of cephalopod were identified within the Atlas of Living Australia report as being present within the wider EMBA.

4.5.5 Marine Reptiles

Results from the EPBC Act Protected Matters Database revealed that there are two endangered and migratory, and one vulnerable and migratory species of marine reptile that may be present within the OA. These are the loggerhead turtle, leatherback turtle, and green turtle. In addition, the hawksbill turtle and flatback turtle may be present within the EMBA based on the EPBC Act Protected Matters Database search results. Both these species are listed vulnerable and migratory. There are no species of sea snake identified as potentially present within the OA or EMBA based on the EPBC Act Protected Matters Database search results.

No breeding behaviours occur within the OA or EMBA, however, foraging, feeding or related behaviour is known to occur within the OA and EMBA for some species. There are no BIAs for marine reptile species of relevance to the OA or EMBA. The Turtle Recovery Plan (Commonwealth of Australia, 2017a) has identified areas as '*habitat critical to the survival of a species*'. There are no such areas identified within the OA or EMBA.

A description of the distribution, preferred habitat and life stages of the identified threatened marine reptile species is provided in **Table 24,** including commentary on their likely presence in the OA and EMBA.

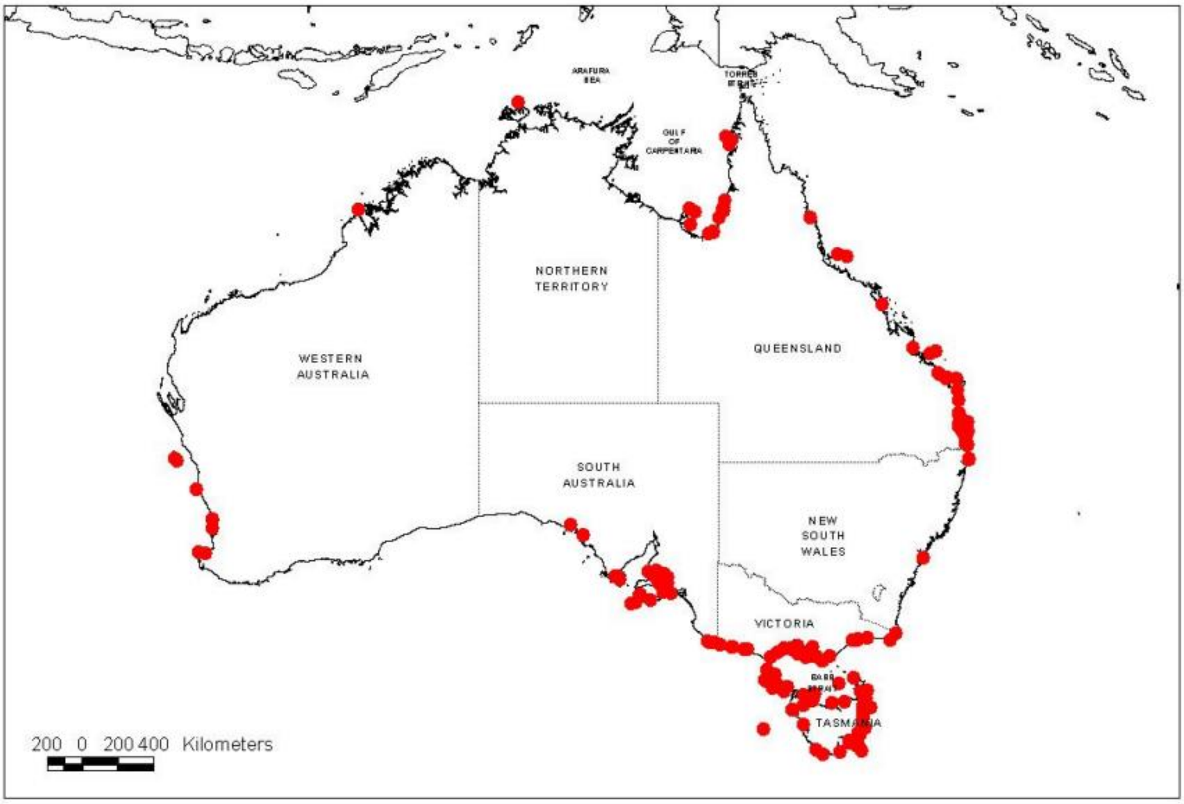
Table 24 EPBC Act List of Threatened and/or Migratory Marine Reptiles Potentially Occurring in the OA and/or EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Records in OA/EMBA	Presence Within the OA and EMBA
Loggerhead Turtle *Caretta caretta*	E, M	Has a distribution throughout tropical, sub-tropical, and temperate waters (Bolten and Witherington, 2003). It is estimated that approximately 2 – 4% of the total global population of loggerhead turtles occurs in Australia, with the majority occurring in eastern and western Australia (DoCCEEW, 2023); In Australia, this species occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays (Limpus, 1995). Although nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, foraging areas are widely distributed, with females tagged at the south-east Queensland nesting areas recorded in waters off Indonesia, Papua New Guinea, Solomon Islands, New Caledonia, Northern Territory, Queensland, and NSW (Limpus, 2008); Large immature and adult loggerhead turtles feed in a wide range of tidal and subtidal habitats including coral and rocky reefs, sea grass meadows, and soft-bottomed sand or mud areas (Limpus, 2008). Adults feed mainly on hard-bodied, slow-moving invertebrates including molluscs and small crabs (Limpus, 2008); Loggerheads nest of sandy beaches. Hatchlings disperse and spend up to 15 years at sea (Bjorndal *et al*., 2000) where they forage in the top 5 m of the water column (Spotila, 2004). Breeding adults then develop site fidelity to both benthic foraging (out to depths of 55 m, Plotkin *et al*., 1993) and nesting locations (Limpus, 2008); Loggerhead turtles have been recorded infrequently in TAS, VIC and South Australia (Limpus, 2008), including at Mallacoota, VIC, 620 km north-east of the OA (Robertson and Coventry, 2019), and in South Australia including northern Spencer Gulf waters and north-west of Kangaroo Island, over 385 km north-west of the OA (DoCCEEW, 2023).	OA and EMBA	Species LIKELY to occur in OA and KNOWN to occur in EMBA. Foraging, feeding or related behaviour KNOWN to occur within OA and EMBA
Leatherback Turtle, Leathery Turtle, *Dermochelys coriacea*	E, M	Found globally in tropical and temperate oceans (Behler *et al*., 1996). Leatherback turtles are highly pelagic and are known to occur in all waters around Australia (Robins *et al*., 2002); There are no major breeding concentrations of leatherback turtles recorded in Australia, however, low density nesting has been recorded at a limited number of sites in the north and east of Australia, including Wreck Rock Beaches and Rules Beach, southern Queensland, and Coburg Peninsula and Arnhem Land, Northern Territory (Limpus, 2009). Coarse sandy beaches are preferred for nesting (Limpus *et al*., 1984);	OA and EMBA	Species or species habitat KNOWN to occur within OA. Foraging, feeding or related behaviour KNOWN to occur in EMBA.

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Records in OA/EMBA	Presence Within the OA and EMBA
		Forages year round over the Australian continental shelf pelagic habitat, but mostly in the south half of Australia (Hamann *et al.*, 2006). A foraging preference for steep bathymetry and converging currents is possible (Houghton *et al*., 2006). Dives to over 1,000 m have been recorded (Houghton *et al*., 2008). Adults feed mainly on pelagic soft-bodied creatures such as jellyfish and tunicates (Bone, 1998). The appearance of leatherback turtles in cool temperate waters is thought to be driven by the seasonal occurrence of large planktonic animals, including jellyfish (Hamann *et al.*, 2006). During times of upwelling, individuals can be regularly seen in southern Australian waters where currents converge with steep bathymetric contours, feeding at all levels of the water column from the surface to the bottom (Hamann *et al*., 2006; Limpus, 2006; Prince, 2004); Leatherback turtles are regularly seen in TAS and VIC during the summer months, particularly in the western and eastern Bass Strait (**Figure 22**); however, records of this species in VIC have decline in recent years, with only seven records between 2012 and 2017 (SWIFT, 2021a); Breeding females can lay up to five times over the nesting period (Spotila *et al*., 1996), but only nest every 2-3 years. Hatchlings disperse widely, but juvenile movements unknown (Lutz and Musick, 1996). Adults make large scale migrations to foraging areas in temperate seas (Benson *et al*., 2007).		
Green Turtle *Chelonia mydas*	V, M	Green turtles are distributed in subtropical and tropical waters of the northern and southern hemispheres (Prince, 1994). The green turtle is the most widespread and abundant turtle species in Australian waters (Limpus, 2002); Major breeding sites for green turtles occur on the north-west, northern and north-east coasts of Australia (Limpus, 2009). Females remain within 5 – 10 km of their nesting beach during the inter-nesting period (Pendoley, 2005). Immature and adult green turtles forage year-round in tidal and sub-tidal habitats including coral and rocky reefs, sea grass meadows and algal turfs on sand and mud flats (Limpus, 2009b). Most green turtles migrate across distances less than 1,000 km, following no given paths. However, in 2015, a green turtle was found on the beach at Yambuk, VIC, approximately 55 km north-west of the OA (McNeil, 2015).	OA and EMBA	Species of species habitat MAY occur within OA. Foraging, feeding or related behaviour KNOWN to occur within EMBA.
Flatback Turtle *Natator depressus*	V, M	Nesting for the entire species is restricted to the northern half of Australia where four breeding populations are recognised – eastern QL, Torres Strait and Gulf of Carpentaria, NT and WA (Limpus, 2007); Flatback turtles last a post-hatching dispersal phase (Walker and Parmenter, 1990) and instead have been reported to stay in coastal waters near breeding beaches.	EMBA	Species or species habitat KNOWN to occur in EMBA.

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Records in OA/EMBA	Presence Within the OA and EMBA
		Distribution modelling of flatback turtles indicated a preference for foraging and transiting in clear waters, 60 – 90 m deep, and in association with complex, benthic geomorphology (banks, shoals, terraces, deep holes and valleys) thought to support a high abundance of sessile invertebrates, the likely targets of their foraging (Thums *et al*., 2017).		
Hawksbill Turtle *Eretmochelys imbricata*	V, M	Hawksbill turtles are found in tropical, sub-tropical and temperate waters around the world (DoCCEEW, 2023). Australia supports two genetically distinct populations: 1) on the Northwest Shelf of Western Australia and 2) comprised of Great Barrier Reef, Torres Strait and Arnhem Land. These populations represent two of the five most significant breeding populations globally (see Hoenner *et al*., 2016); In Australia, hawksbill turtles are omnivorous, and consume a variety of animals and plants including sponges, hydroids, cephalopods, gastropods, cnidarians, seagrass and algae (Whiting, 2000).	EMBA	Foraging, feeding or related behaviour KNOWN to occur within EMBA.

Note: EPBC Act Status: E= Endangered V= Vulnerable, M= Migratory



Source: Limpus 2009

Figure 22 Distribution of Leatherback Turtle Foraging Records in Australia

4.5.6 Marine Mammals

The EPBC Act Protected Matters Report, revealed 34 species of marine mammal (31 cetaceans and three pinnipeds) as having a potential presence within the OA, with four additional species also having a potential presence within the wider EMBA (three cetaceans and one pinniped). These species are listed in **Table 25** along with the 'presence ranking' (as assigned by the Protected Matters Database for both the OA and EMBA), their threat category and migratory status under the EPBC Act. Given the pelagic nature of the OA and parts of the EMBA, several of these species are migratory and are characterised as having large oceanic distributions that are influenced by spatial and temporal variances between feeding and breeding grounds.

Table 25 Marine Mammal Species Potentially Occurring in the OA and EMBA

Scientific name	Common name	Presence ranking in OA	Presence ranking in EMBA	EPBC Act Threatened category	EPBC Act Migratory status
Balaenoptera musculus	Blue Whale	Known	Known	Endangered	Migratory
Balaenoptera acutorostrata	Minke Whale	May	May	-	-
Balaenoptera bonaerensis	Antarctic Minke Whale, Dark-shoulder Minke Whale	Likely	Likely	-	Migratory
Balaenoptera physalus	Fin Whale	Known [FK]	Known	Vulnerable	Migratory
Balaenoptera borealis	Sei Whale	Known [FK]	Known	Vulnerable	Migratory
Eubalaena australis	Southern Right Whale	Known	Known [BK]	Endangered	Migratory
Megaptera novaeangliae	Humpback Whale	Known [FK]	Known	-	Migratory
Balaenoptera edeni	Bryde's Whale	-	May	-	Migratory
Caperea marginata	Pygmy Right Whale	Likely [FL]	Likely	-	Migratory
Physeter macrocephalus	Sperm Whale	May	Known [FK]	-	Migratory
Tasmacetus shepherdi	Shepherd's Beaked Whale, Tasman Beaked Whale	May	May	-	-
Mesoplodon mirus	True's Beaked Whale	May	May	-	-
Berardius arnuxii	Arnoux's Beaked Whale	May	May	-	-
Mesoplodon bowdoini	Andrew's Beaked Whale	May	May	-	-
Hyperoodon planifrons	Southern Bottlenose Whale	May	May	-	-
Mesoplodon grayi	Gray's Beaked Whale, Scamperdown Whale	May	May	-	-
Mesoplodon densirostris	Blainville's Beaked Whale, Dense-beaked Whale	May	May	-	-
Mesoplodon hectori	Hector's Beaked Whale	May	May	-	-
Mesoplodon layardii	Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale	May	May	-	-
Ziphius cavirostris	Cuvier's Beaked Whale, Goose-beaked Whale	May	May	-	-
Mesoplodon ginkgodens	Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale	-	May	-	-
Orcinus orca	Killer Whale, Orca	Likely	Likely	-	Migratory
Pseudorca crassidens	False Killer Whale	Likely	Likely	-	-
Globicephala macrorhynchus	Short-finned Pilot Whale	May	May	-	-
Globicephala melas	Long-finned Pilot Whale	May	May	-	-
Kogia breviceps	Pygmy Sperm Whale	May	May	-	-
Kogia sima	Dwarf Sperm Whale	May	May	-	-

Scientific name	Common name	Presence ranking in OA	Presence ranking in EMBA	EPBC Act Threatened category	EPBC Act Migratory status
Grampus griseus	Risso's Dolphin, Grampus	May	May	-	-
Tursiops truncatus s. str.	Bottlenose Dolphin	May	May	-	-
Tursiops aduncus	Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	May	Likely	-	-
Lissodelphis peronii	Southern Right Whale Dolphin	May	May	-	-
Lagenorhynchus obscurus	Dusky Dolphin	Likely	Likely	-	Migratory
Delphinus delphis	Common Dolphin, Short-beaked Common Dolphin	May	May	-	-
Phocoena dioptrica	Spectacled Porpoise	-	May	-	Migratory
Arctocephalus pusillus	Australian Fur-seal, Australo-African Fur-seal	May	Known	-	-
Arctocephalus forsteri	Long-nosed Fur-seal, New Zealand Fur-seal	May	Known	-	-
Neophoca cinerea	Australian Sea Lion	May	Known	Endangered	-
Mirounga leonina	Southern Elephant Seal	-	May [BM]	Vulnerable	-
Key: FK - Foraging, feeding or related behaviour known to occur within area FL - Foraging, feeding or related behaviour likely to occur within area BK - Breeding known to occur within area BM - Breeding may occur within area					

There are several BIAs for marine mammals in the vicinity of the OA and EMBA as follows:

- The OA overlaps with pygmy blue whale BIAs for foraging as illustrated in **Figure 23.** These BIAs identify foraging areas of 'high annual use', 'known foraging areas' and 'possible foraging areas'. It is also noteworthy that the remainder of the OA has also recently been nominated as biologically important habitat;
- The OA overlaps with the southern right whale 'known core range' BIA as illustrated in **Figure 24**. In addition, an 'aggregation' BIA and 'migration/resting on migration' BIA also lie inshore of the OA. The boundary of the aggregation BIA occurs 14 km north of the OA. It is noteworthy that the SRW BIAs are currently being reviewed and that updated BIAs are expected to be published before the end of 2023. The Draft National Recovery Plan for the Southern Right Whale (CoA, 2022) includes indicative revised BIAs, but these are subject to change until finalised. For this reason, content of the EP is underpinned by the existing BIAs (as illustrated in **Figure 24**); however, TGS is committed to utilising whichever version of the BIAs is current at the time of survey acquisition and is watching this space carefully;
- A foraging BIA for humpback whales is located within the EMBA, approximately 640 km northeast of the OA (**Figure 25**);
- A foraging BIA for sperm whales is located within the EMBA, approximately 326 km northwest of the OA (**Figure 25**); and

- Two foraging BIAs for Australian sea lions are located within the EMBA, a foraging BIA (male) is located approximately 97 km northwest of the OA and foraging BIA (male and female) is located approximately 312 km northwest of the OA (**Figure 26**).

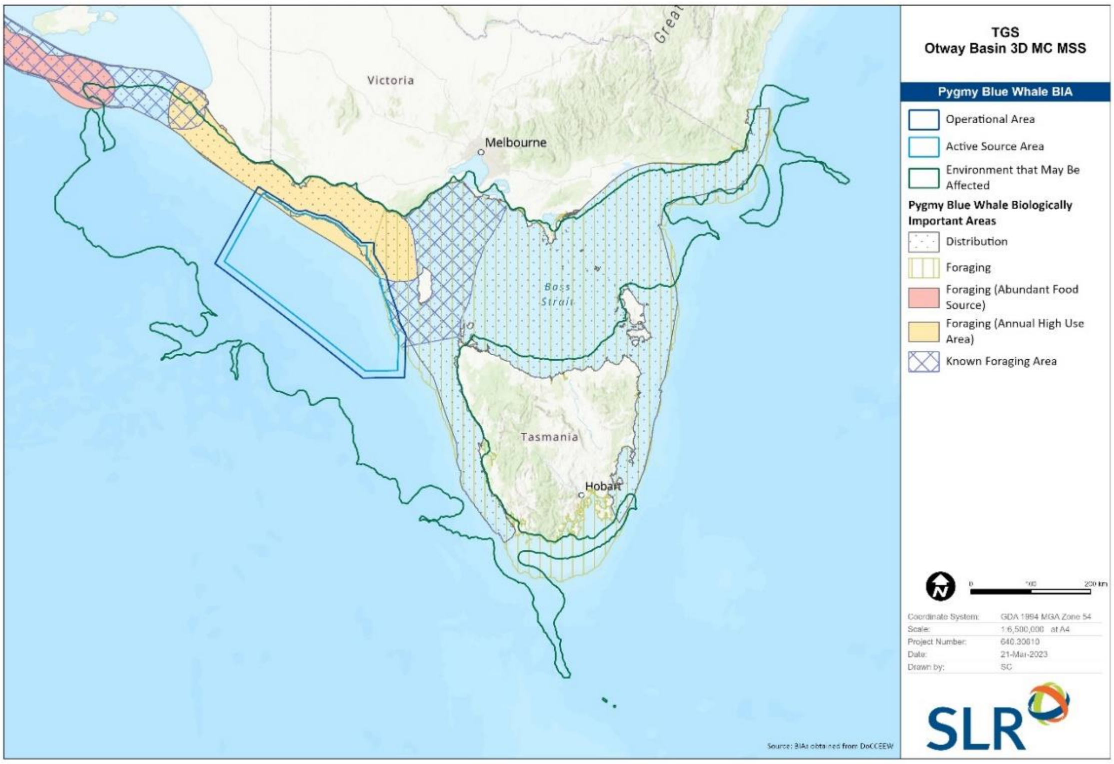


Figure 23 Blue Whale BIAs in the Vicinity of the OA and EMBA

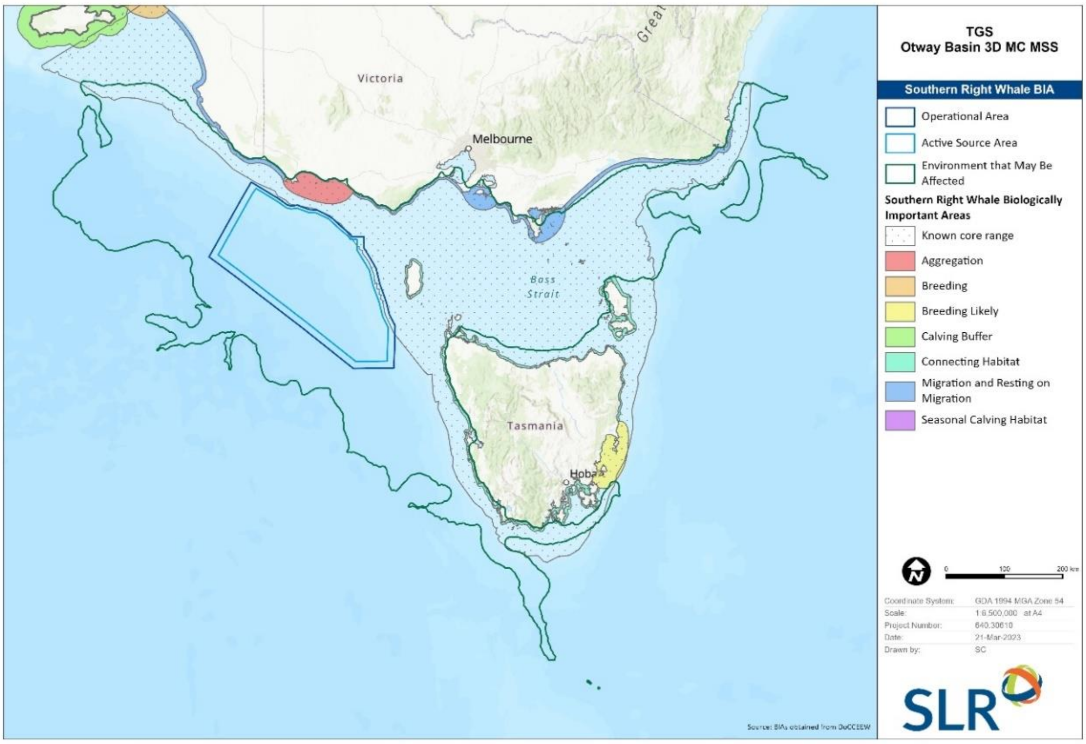


Figure 24 Southern Right Whale BIAs in the Vicinity of the OA and EMBA

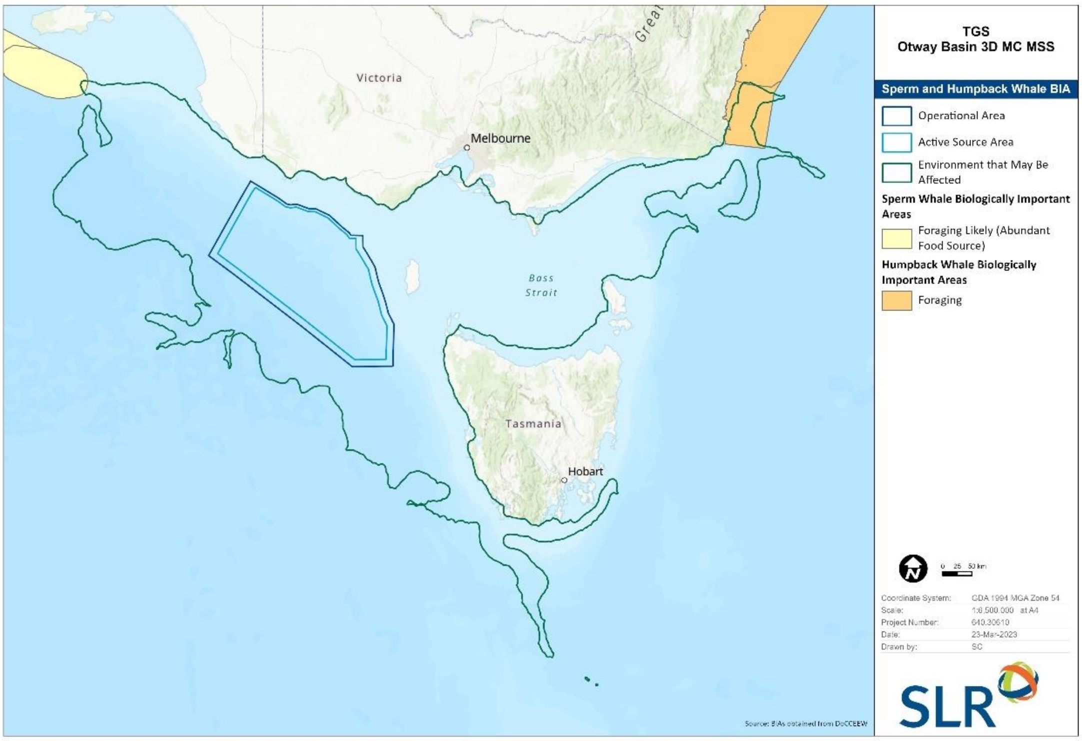


Figure 25 Humpback Whale and Sperm Whale BIAs in the Vicinity of the OA and EMBA

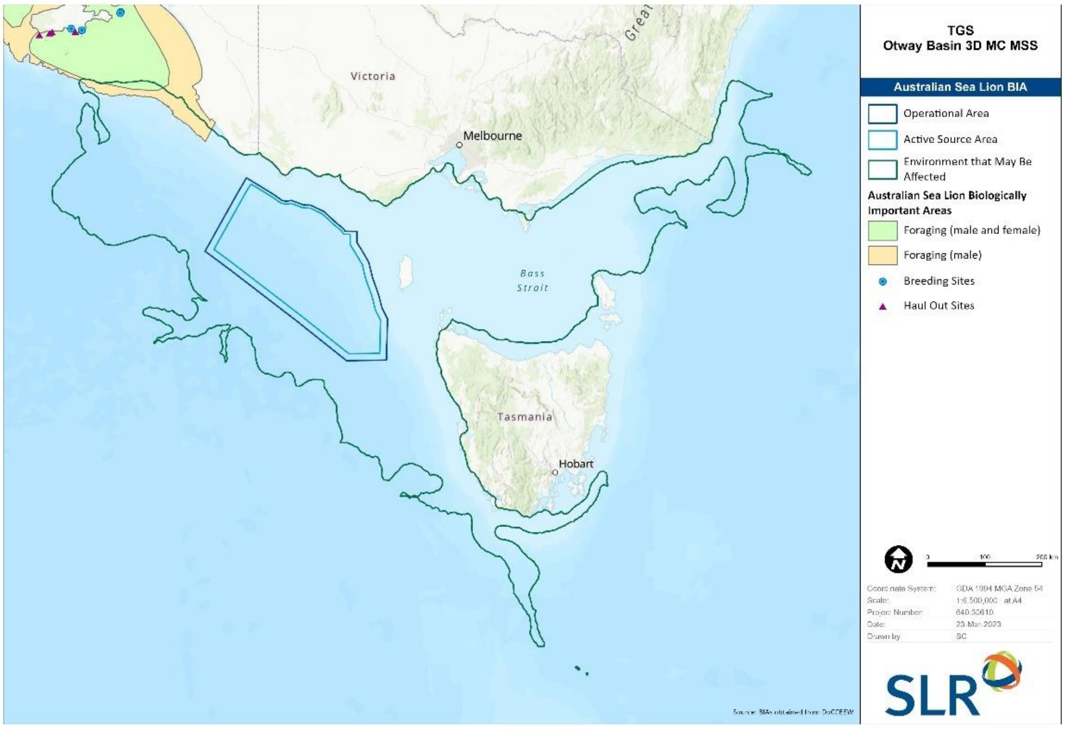
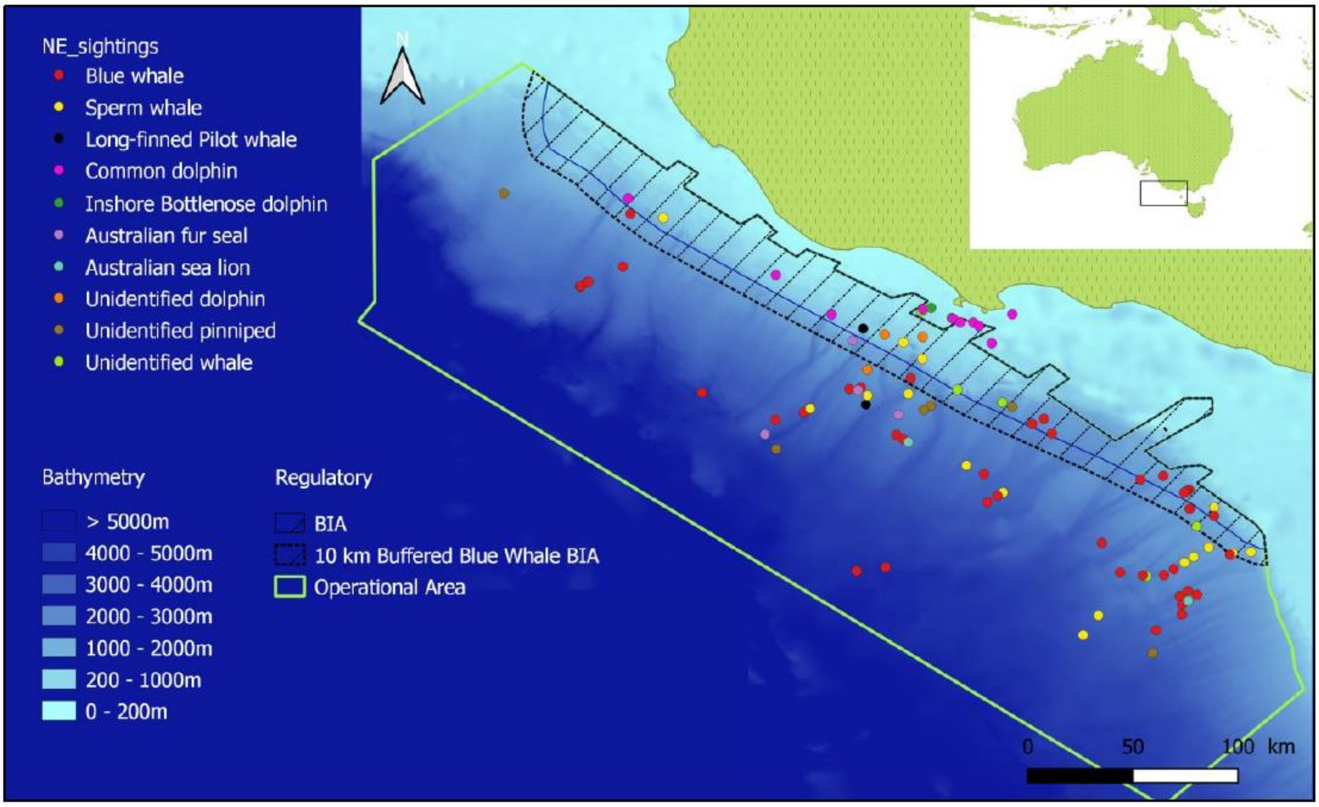


Figure 26 Australia Sea Lion BIAs in the Vicinity of the OA and EMBA

In January to April 2020, Schlumberger Australia Pty Limited (**SLB**) acquired the Otway Basin 2DMC MSS over a similar area to the OA for the Otway Basin 3D MC MSS. The marine mammal detections from this survey are illustrated in **Figure 27** and provide some additional context as to the species that the survey vessels may encounter within the OA during the Otway Basin 3D MC MSS.

Ecological summaries for marine mammal species 'known' or 'likely' to be present in the OA and EMBA are provided in the following subsections, along with those additional species that were detected during the Otway Basin 2DMC MSS.



Source: Seiche Environmental 2020

Figure 27 Sightings of Marine Mammals During the Otway Basin 2DMC MSS

4.5.6.1 Cetaceans – Baleen Whales

Baleen whale species are typically migratory between summer feeding areas and winter breeding areas; hence they have strong seasonal variations in distribution. **Table 26** provides a summary of the expected timing of baleen whale presence in and around the OA.

Table 26 Predicted Timing of Baleen Whale Presence within Operational Area

Species	January	February	March	April	May	June	July	August	September	October	November	December
Blue whale												
Southern right whale												
Humpback whale												
Fin whale												
Sei whale												
Minke whale												
Pygmy right whale												

Key:			
Breeding/calving		Peak breeding/calving	
Presence during migrations/movements		Resident population, or consistent presence of transients	
Feeding		Peak feeding	
Most likely time of presence with unspecified activity – most likely feeding			

4.5.6.1.1 Blue/Pygmy Blue Whale

Blue whales (*Balaenoptera musculus*) are widely distributed throughout the world's oceans and comprise two recognised sub-species in the Southern hemisphere: the Antarctic blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (**PBW**) (*Balaenoptera musculus brevicauda*). These two subspecies are difficult to distinguish without the use of genetic techniques, but differ in morphology, distribution, and vocal behaviour. Following an analysis of acoustic detections, and stranding, sighting and historical catch records, Branch *et al*. (2007) concluded that the majority of blue whales in the Australian region are PBW, but that a few Antarctic blue whales (typically found in waters south of 60° S) may migrate to Australia in the austral winter; however, the movement of Antarctic blue whales is poorly understood (CoA, 2015a).

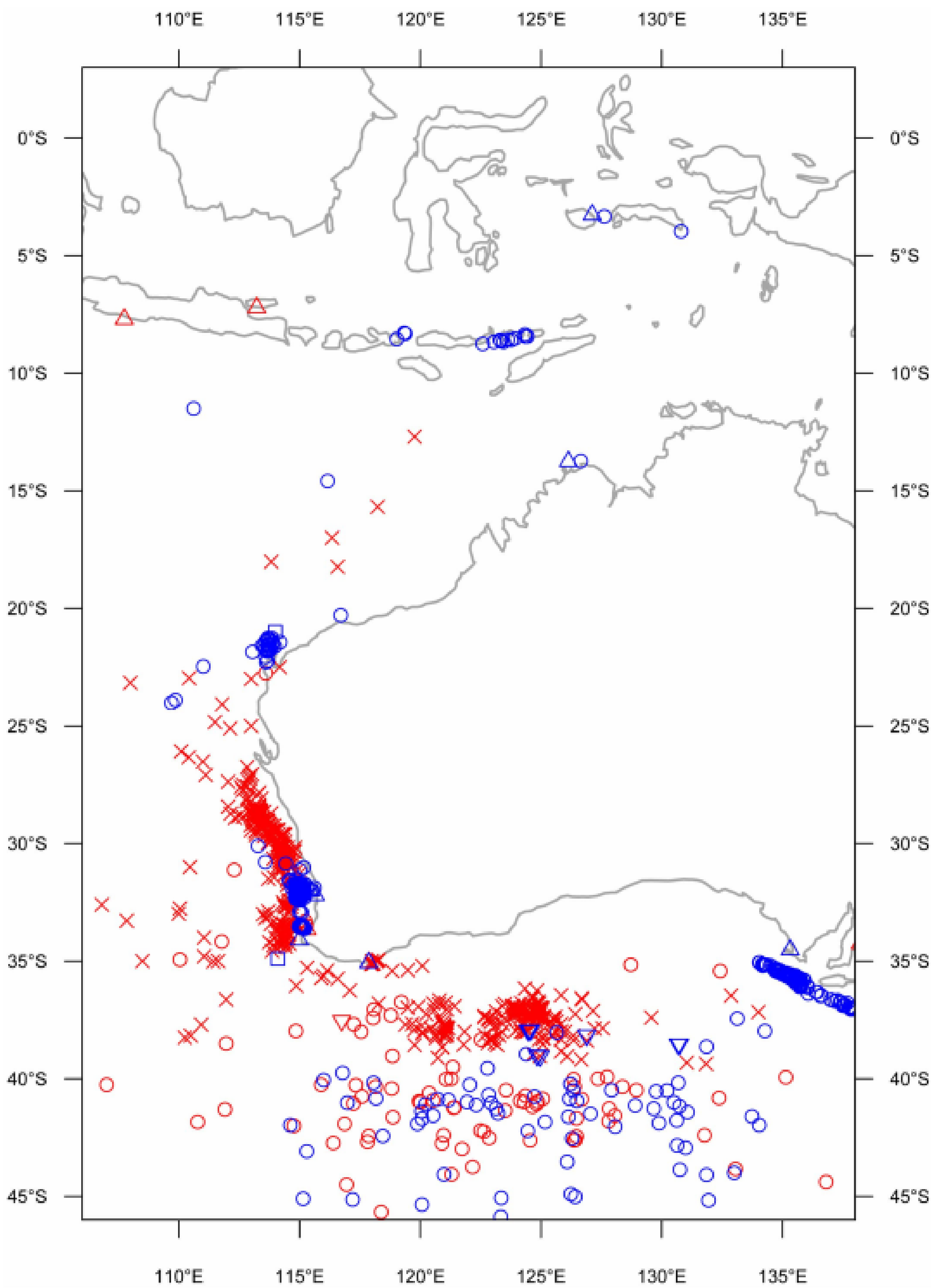
In Australasian waters, the PBW is generally separated into two subpopulations: Eastern Indian Ocean PBWs and New Zealand PBWs (CoA, 2015a). Blue whales are listed as Endangered under the IUCN Red List, and in Australia they are listed as Endangered and Migratory under the EPBC Act 1999. Sightings of blue whales during the Otway Basin 2DMC MSS in 2020 are shown in **Figure 27**.

PBWs have been recorded in waters off all Australian states and the Northern Territory (DEH, 2005; Woinarski *et al.,* 2014). Blue whales are believed to calve in tropical waters in winter, and evidence suggests that the breeding ground for PBWs occurs in Indonesian waters, including Banda Sea, Molucca Sea, Timor Sea and Savu Sea (Gales *et al*., 2010; Thums *et al.,* 2021; Branch *et al.,* 2007; Double *et al.,* 2014; Möller *et al.,* 2020). Sexual maturity of pygmy blue whales is reached at approximately 10 years of age, and adult females calve every two to three years (CoA, 2015). Migration paths are widespread; however, the migratory route of pygmy blue whales off WA enroute to the breeding grounds occurs mostly over continental slope habitat, but the use of continental shelf habitat is more typical of PBW movements off South Australia (Thums *et al*., 2021).

Using data from both satellite tagging studies (2009 – 2021, a total of 22 tagged whales) and acoustic monitoring studies (2006 – 2019), the three most important feeding grounds in Western Australia for PBWs have recently been confirmed by Thums *et al*. (2021) as being 1) the Perth Canyon and vicinity, 2) the shelf edge off Geraldton, and 3) the shelf edge from Ningaloo Reef to Rowley Shoals. Important feeding grounds off the south coast of Australia include Duntroon sub-basin, South Australia; and at the Bonney Upwelling and adjacent waters off South Australia and VIA (Gill, 2002). Photo identification (Garcia-Rojas *et al*., 2018) and genetic evidence (Attard *et al*., 2010) suggests that whales utilising these feeding grounds are from the same population (Attard *et al*., 2010). Historical catch data and limited satellite tagging data also suggest that the northern boundary of the Southern Ocean, known as the Southern Tropical Convergence (**STC**), also constitutes feeding habitat for PBWs, although it is more likely to be a broad, ephemeral feeding site than a focused hotspot (CoA, 2015a; Garcia-Rojas *et al*., 2018). Pygmy blue whales feed on krill and depend on areas of high krill density to meet their high calorific requirements.

The Bonney Upwelling feeding aggregation lies within the boundaries of the OA and PBW feed here seasonally (Gill *et al.,* 2011). For this reason, the upwelling has been identified as a BIA for blue whales (Conservation Values Atlas, 2023). The Bonney upwelling is the largest and most unpredictable of upwellings in south-eastern Australia and extends west from Cape Nelson. It is part of a regional upwelling system with an alongshore extent of ~800 km from the Bass Strait to the eastern GAB upwelling and Kangaroo Island canyons (see **Section 4.4.3.2** for further details).

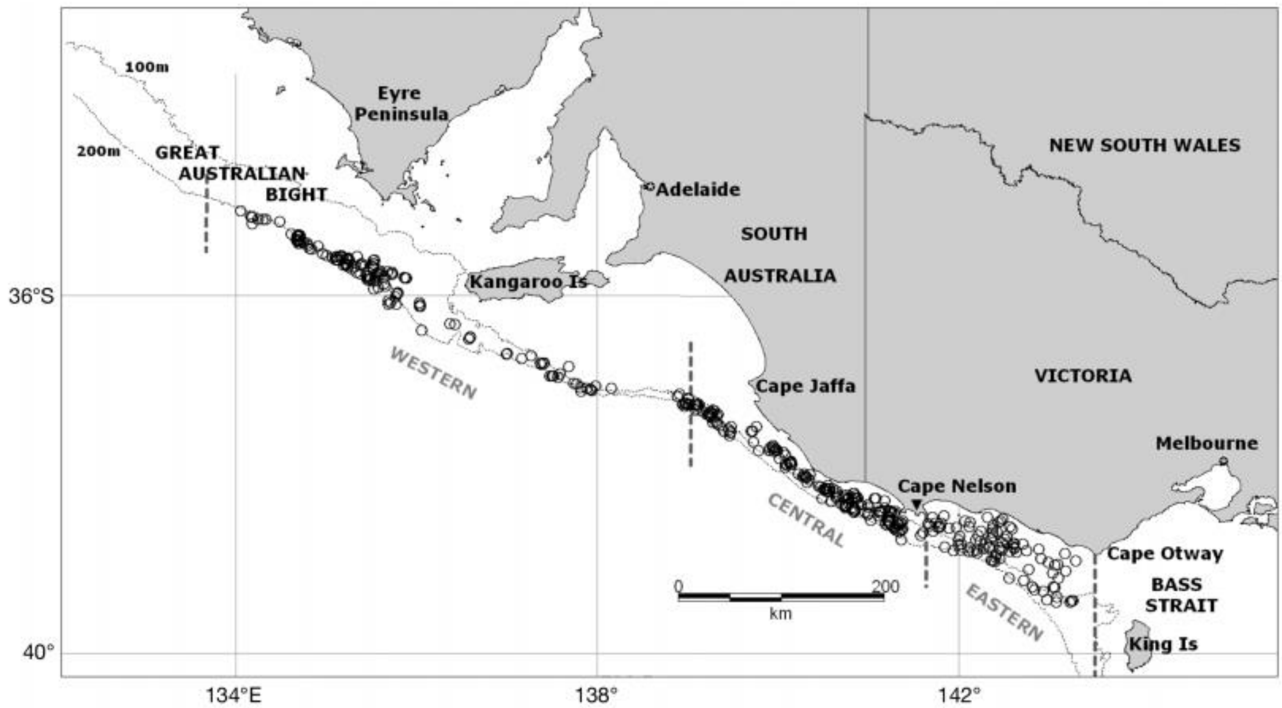
Use of the Bonney Upwelling by PBW was first noted by Gill (2002) who identified localised aggregations of blue whales feeding on coastal krill in southern Australian coastal waters from December to May, and a noticeable absence of blue whales from the area in winter and spring. Branch *et al.* (2007) analysed historic acoustic detections (see **Figure 28**) and found a peak in call rate of pygmy blue whales within the Australian region from February to May, and a limited number of Antarctic blue whale calls from May to October.



Source: Double *et al.* (2014) – modified from Branch *et al.* (2007)

Figure 28 Historic Catch (x), Sighting (o), Stranding (Δ), Acoustic Recordings (▫) and Discovery Mark (∇) Data of Pygmy Blue Whales

Between 2002 and 2007, Gill *et al*. (2011) undertook aerial surveys and plotted the distribution of blue whale sightings (**Figure 29**) to establish links between feeding PBWs and the cold water, nutrient-rich regional upwellings. **Figure 29** is split into the western, central, and eastern zones, with the OA corresponding to the eastern zone and the eastern section of the central zone. Within the upwelling system, the fine scale distribution of blue whales varied according to the local prevalence of krill, but in general foraging occurred in the west of the system early in the upwelling season, spreading eastward until April, then returning towards the west prior to departure for winter grounds in April/May (Gill *et al.,* 2011). The aerial survey data suggests that low densities of PBWs moved eastward in November and December, with PBWs restricted largely to the western and central zones. PBWs moved into the eastern zone from December onward, with animals widely distributed throughout the central and eastern zones from January to April. In the eastern zone abundances peaked in February. Most animals departed from the feeding ground by late April (Gill *et al*., 2011). Over the course of the foraging season, the central zone was the most consistently utilised (Gill *et al.,* 2011). As there was no visible krill at the surface of most sightings (52%), the blue whales sighted in this study were either in transit or feeding deeper in the water column (Gill *et al.,* 2011). More recent unpublished information suggests that in some years reasonable numbers of blue whales can be present in and around the OA as early as November and December (P. Gill pers comm.), highlighting the interannual variability in the feeding season.



Source: Gill *et al*., 2011

Figure 29 Distribution of Blue Whale Sightings, 2002 – 2007

Similar patterns have also been observed from subsequent aerial surveys conducted after 2007 and until 2013, although noting survey effort was relatively low during the period 2008 - 2011 (Gill *et al*., 2015). Jolliffe *et al*., (2021) found that peaks in PBW vocal activity off Portland occurred from January through to April, thereby supporting findings that PBWs remain in the Bonney Upwelling region for several months, likely utilising the central and eastern zones during this period.

PBWs were observed aggregating in a relatively narrow band around a mean depth of 86 m to the west of Portland along or near surface temperature fronts (where temperature may vary by up to 5°C). This aggregation point was associated with elevated levels of chlorophyll *a*, which occurs downstream from upwelling centres and attracts swarms of the krill *Nyctiphanes australis* (Gill *et al*., 2011). Tagged whales have also been shown to spend time in secondary upwelling areas such as around Kangaroo Island (Möller *et al.,* 2020). Morrice *et al*. (2004) reported numbers of PBWs were found feeding on abundant krill surface swarms along the 200 m shelf break to the west and south of Kangaroo Island in December 2003.

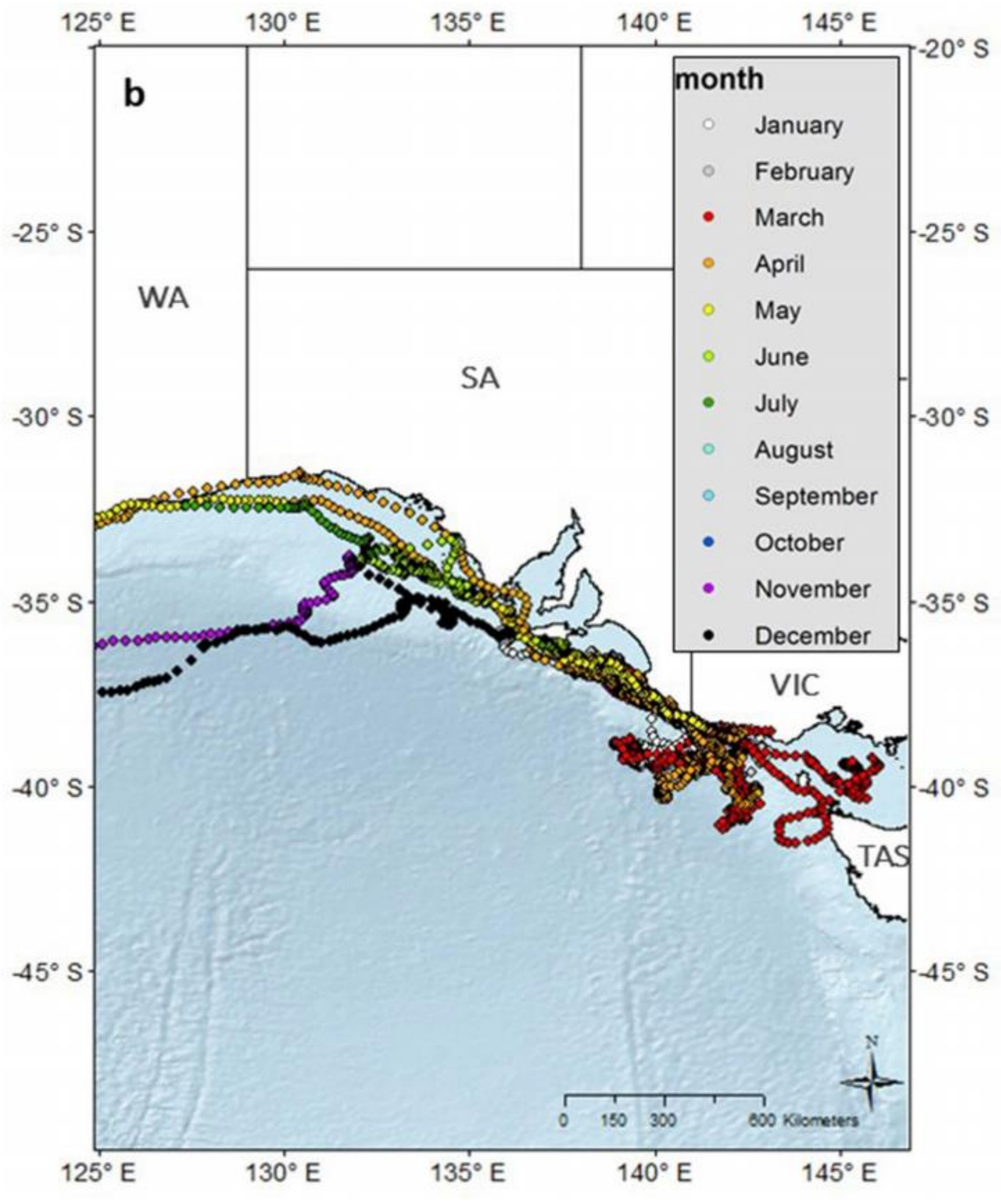
A review of the 2002 – 2007 aerial survey data found 80% of PBWs were encountered at water depths between 50 – 150 m and 93% of sightings occurred in depths <200 m in the eastern and central zones, with 10% of sightings within 5 km of the 200 m isobath (Gill, 2020, as cited in Conoco Phillips, 2021). Encounter rates in the eastern zone peaked in February (9.8 whales/1,000 km) and March (8.8 whales/1,000 km) then declined to approximately 4 whales/1,000 km in April and to a single sighting in May (0.4 whales/1,000 km). No PBWs were encountered in the eastern zone in November, with an encounter rate of 1 whale/1,000 km in December (Gill 2020 as cited in Conoco Phillips 2021). Overall, PBWs were encountered in the central zone at more than twice the rate observed in the eastern zone (11 whales/1,000 km vs 4.8 whales/1,000 km) (Gill 2020 as cited in Conoco Phillips 2021).

Mean group size is typically small; 1.3±0.6 individuals (Gill, 2020). This is consistent with the findings of Branch *et al*. (2007) who reported that 65.2% of blue whale sightings in the Southern Hemisphere and northern Indian Ocean were of a single whale and 24.6% were of a pair, with only rare sightings of groups composed of more than five individuals.

Historical (Mikhalev, 2000; Branch *et al.,* 2007) and more recent (Miller *et al*., 2012; Garcia-Rojas *et al*., 2018; Möller *et al*., 2020) records also show lower numbers of PBWs can be found in deeper waters of the OA and the broader region, including at depths greater than 2,000 m (Miller *et al*., 2012). Satellite tagging evidence that individual blue whales may move between the Bonney Upwelling and the STC feeding grounds further south also suggests that individual whales may make independent foraging choices based on prey availability (Garcia-Rojas *et al*., 2018). Garcia-Rojas *et al*. (2018) tagged four PBWs at Discovery Bay, west of Portland, in April 2005 with three tags transmitting data for 9 – 15 days and one for 17 days. The three shorter duration tags showed the whales remained over the continental shelf until tag transmissions ceased, while the fourth whale tracked due south to the STC after 12 days, with the final received position being south of the OA at 39^{o}57'S, 139^{o}29'E (Garcia-Rojas *et al*., 2018).

Möller *et al*. (2020) satelitte tagged 13 PBWs in the Bonney Upwelling region in January 2015, including 12 unaccompanied adults and one cow-calf pair. Whales were tracked for an average of 116 ± 114 days, ranging from 3 to 282 days (**Figure 30**). After tagging, whales remained in the Bonney Upwelling and broader southern Australian coastal region from at least January to July 2015, for an average of 54.6 ± 29.4 days (range 3 – 107 days) (Möller *et al.*, 2020). Four tagged whales left the Bonney Upwelling region between late April and July, moving in a westward direction while off the southern Australian coast (Möller *et al*., 2020). In November and December 2015 respectively, two tagged whales returned to the region and remained until at least December 2015 and March 2016, spending 69 and 166 days respectively in the region between the two annual feeding seasons.

The continental shelf of the Bonney Upwelling region showed the highest occupancy rate by the whales, consistent with the results by Gill (2011), with whales presumably feeding on *N. australis* (Möller *et al*., 2020). However, a few whales, including the cow-calf pair, were observed to utilise the area over the slope and deep sea, suggesting PBWs may also be feeding in mesopelagic waters and potentially on other krill species associated with deeper waters (Möller *et al*., 2020).

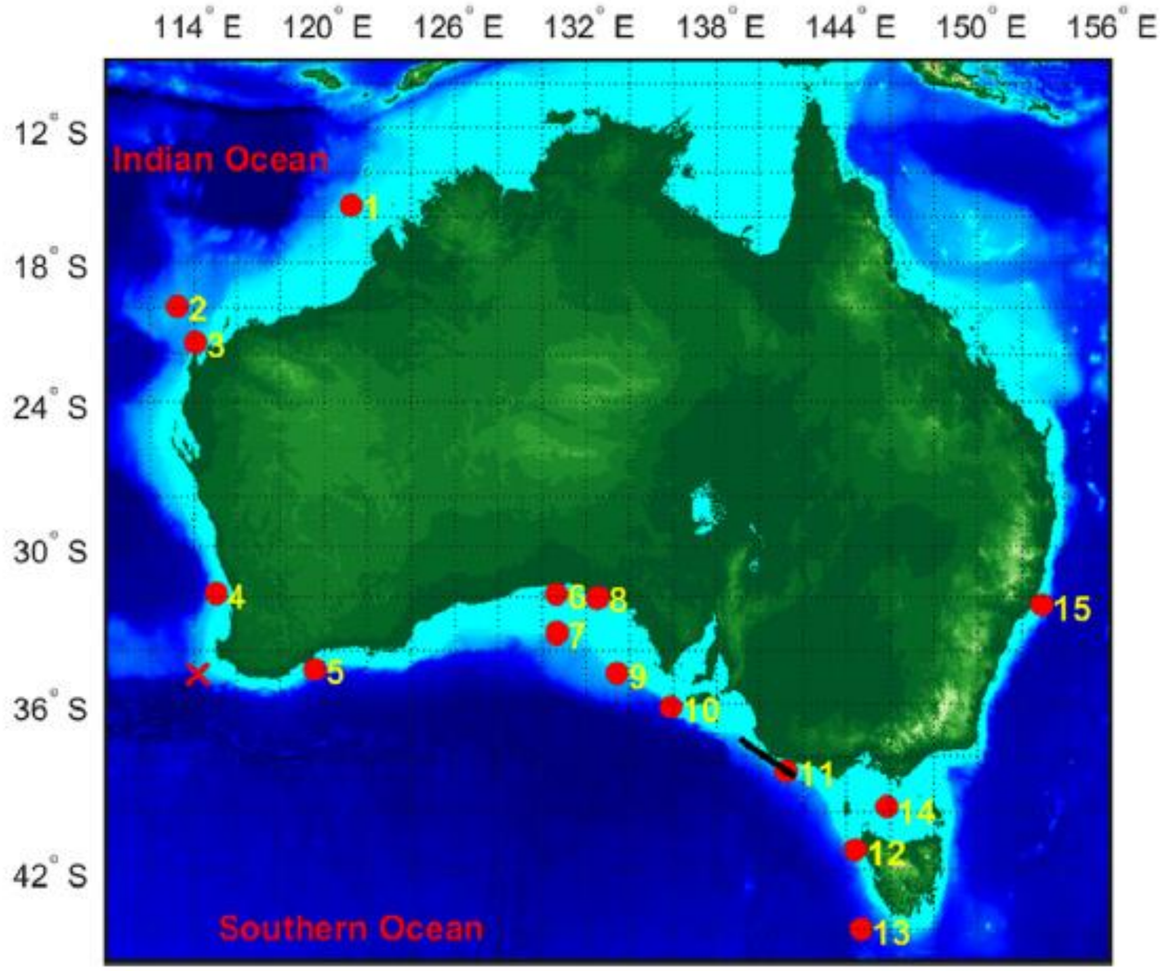


Source: Möller *et al.,* 2020

Figure 30 Satellite tag locations of 13 pygmy blue whales in the Bonney Upwelling region

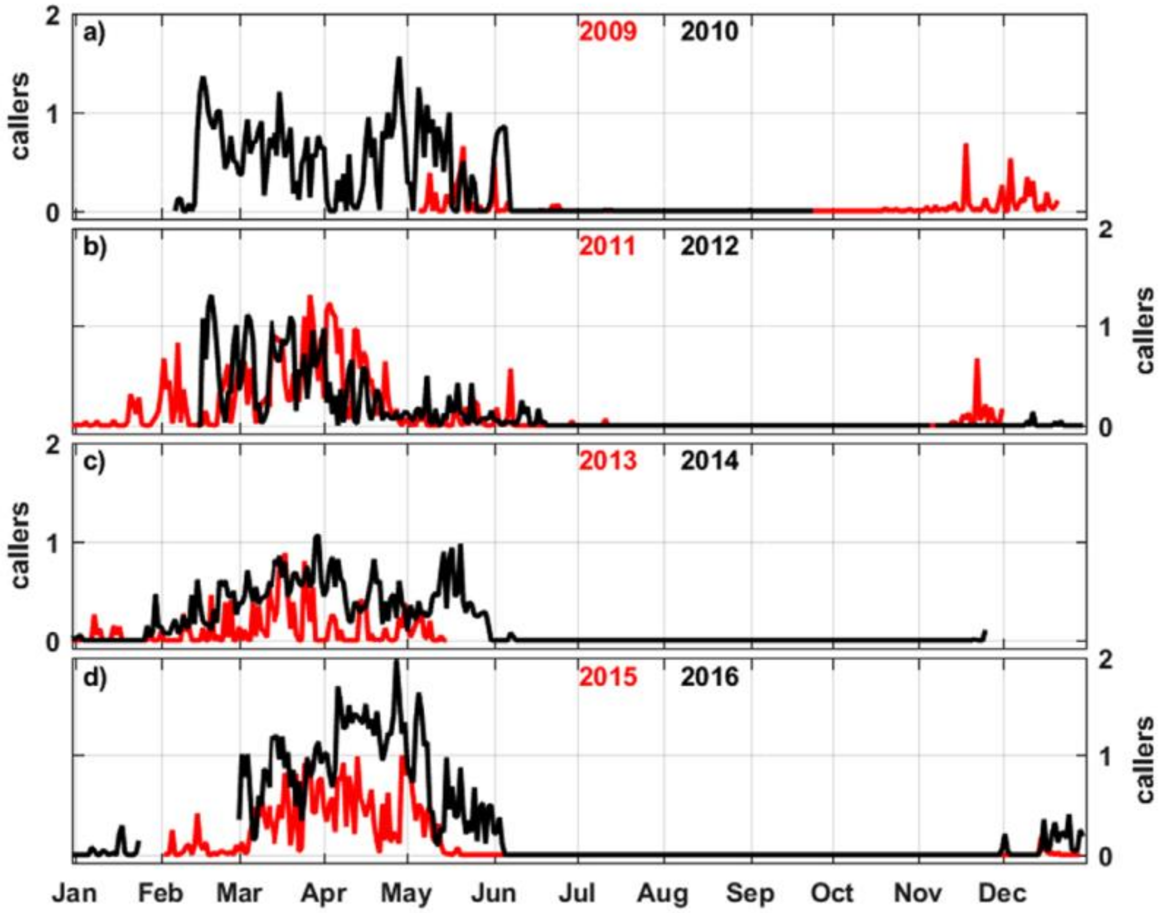
Blue whales vocalise at a low frequency (average of 0.01 – 0.110 kHz) (McDonald *et al.*, 2001; Miller *et al.*, 2014), meaning that their calls travel hundreds of kilometres underwater. Vocalisations of PBWs off Cape Leeuwin, Western Australia have been characterised as songs of either two or three repeating tonal sounds with harmonics (Gavrilov *et al.,* 2011). The most intense tonal sounds were recorded to have a source level of 179 ±2 dB re 1 µPa @ 1 m. Weaker short-duration calls of impulsive down-swept sounds were estimated to have source levels of 168 – 179 dB re 1 µPa @ 1 m (Gavrilov *et al.,* 2011). Different blue whale/PBW populations have different call characteristics (McCauley *et al*., 2018).

McCauley *et al*. (2018) used passive acoustics to record blue whale calls at fifteen sites around Australia from 2000 – 2017 (**Figure 31**). This study found that East Indian Ocean PBWs were present from north-west Western Australia (site 1) south and east to Bass Strait (site 14); New Zealand PBWs were present from Portland (site 11) east to NSW (site 15); and Antarctic blue whales were present at all sites south of 19^{o}S (sites 2-15). Of particular relevance to the OA is the data collected from the Portland receiver (site 11). **Figure 32** illustrates call rates at site 11 (Portland) for the years over which recordings were made, indicating that in most years whales arrived in the region in February and remained until April – June. With the maximum number of calling animals detected at any one time being two. All three blue whale song types were recorded at the Bass Strait and Portland sites (14 and 11) over April to June 2004, but later years found only the two PBW call types present during these months. Garcia-Rojas *et al*. (2018) suggested PBWs vocalize at higher rates when there are no other callers nearby and/or possibly when traveling alone in the open ocean. Call production may also occur at the expense of foraging, with lower call rates by foraging whales compared with those travelling (Oleson *et al.,* 2007).



Source: McCauley *et al.* 2018

Figure 31 Blue Whale Calls at 15 Australian Sites



Source: McCauley *et al.* 2018

Figure 32 Mean number of calling East Indian Ocean Pygmy Blue Whales averaged over 24-hour periods from 2009 – 2016.

Table 27 summarises the information outlined above relating to PBW seasonal use of the upwelling and surrounding waters. Within this table, there is substantial variability in the spatial scale over which the findings are relevant. Where possible, the core feeding season is denoted by a darker grey. From the multiple lines of evidence available PBWs arrive in continental shelf waters of the Bonney Coast to feed around November to December, with peak activity occurring in the vicinity of the OA from January through to April (Gill *et al*., 2011; 2015; Moller *et al.,* 2020; Jolliffe *et al.,* 2021), but with consistent presence expected through until the end of June (McCauley *et al.,* 2018). On this basis, this EP uses the following terminology:

- PBW Foraging Shoulder Season – September to December and July; and
- PBW Peak Foraging Season – January to June (inclusive).

Table 27 Seasonality of Pygmy Blue Whales in the vicinity of the OA

Reference	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Notes
Jolliffe *et al.* (2021)													Peaks in PBW vocal activity off Portland occurred from Jan to Apr.
Möller *et al.* (2020)													Satellite tagging data from 13 PBWs in the Bonney Upwelling in January 2015. Remained in the region from Jan to late Apr - Jul, two returned in Nov/Dec.
McCauley *et al.* (2018)													Passive acoustic monitoring off Portland. Most PBWs arrived in the region in Feb, remaining until Apr – Jun.
Gill *et al.* (2011); (2015); and pers comm.													Aerial surveys. Presence possible from Sep, with low densities in Nov and Dec, widely distributed through the central and eastern zones (vicinity of OA, see **Figure 29**) from Jan to Apr. Most departed by late Apr but seen into May.
Branch *et al.* (2007)													Peak in call rates of historic acoustic detections in broad-scale Australian region from Feb to May
Gill (2002)													Localised feeding aggregations in broad-scale southern Australian waters from Dec to May.

The OA overlaps with a number of PBW foraging BIAs (**Figure 23**). The south-east section of the OA partially overlaps with a PBW known foraging area encompassing the north-west part of Bass Strait, from Cape Otway to Port Phillip Heads and to the south of King Island, and a PBW foraging likely area encompassing the majority of the Bass Strait and the coastal waters of TAS. The northern section of the OA overlaps with the PBW Bonney Upwelling foraging BIA (annual high use area) extending between Cape Otway and Robe. Due to the overlap between the OA and these BIAs, the likelihood of encountering PBW during the Otway Basin 3D MC MSS is '**moderate to high**'.

While the majority of blue whales within the OA are likely to be PBW, the presence of Antarctic blue whales cannot be dismissed; however, acoustic data suggest that this species is more likely present in the region over the cooler months and presence is less consistent than that of PBW. On this basis the likelihood of encountering Antarctic blue whales during the Otway Basin 3D MC MSS is considered to be '**low**'.

4.5.6.1.2 Southern Right Whale

Southern right whales (**SRW**) (*Eubalaena australis*) have a circumpolar distribution throughout the Southern Hemisphere between 16°S and 65°S and occur throughout Australia's southern coastline as far north as Sydney on the east coast and Perth on the west coast (CoA, 2012). They migrate annually from summer feeding grounds to warmer, protected waters over the continental shelf during the Austral winter (IWC, 2001). There are three likely foraging areas used by Australian SRWs: south-west of WA, waters of the subtropical front, and Antarctic waters (Childerhouse *et al*., 2010; Mackey *et al*., 2020; Riekkola *et al*., 2021). Evidence suggests that individual preferences for feeding and breeding grounds are culturally inherited through the maternal line (i.e. whales forage and breed at the same grounds as their mother) (Valenzuela *et al*., 2009; Carroll *et al*., 2015; Patenaude *et al*., 2007). Female SRWs typically show very strong site fidelity to calving grounds (Charlton, 2017; Burnell, 2001).

The SRW was depleted to near extinction as a result of whaling activities in the 19th and 20th centuries (Dawbin, 1986; Tormosov *et al*., 1998; Carroll *et al*., 2014), however post whaling SRW numbers are increasing globally, with the population last estimated at 13,600 individuals in 2009 (IWC, 2013). Currently, SRWs are listed as Least Concern under the IUCN Red List, and in Australia they are listed as Endangered and Migratory under the EPBC Act 1999.

In Australia, the SRW is divided into two 'populations' or 'management units': the western population and the eastern population (CoA, 2022). The western and eastern populations are considered genetically distinct from one another (Carroll *et al*., 2011); however, limited movement between the two areas has been recorded (Burnell, 2001; Pirzl *et al*., 2009; Charlton, 2017; Watson *et al*., 2021) and both populations mix when using shared migratory pathways (CoA, 2022). The western population is recognised to occur in Western Australia and South Australia (primarily between Cape Leeuwin and Ceduna), while the eastern population occurs off VIC, TAS, NSW, and QLD (CoA, 2022).

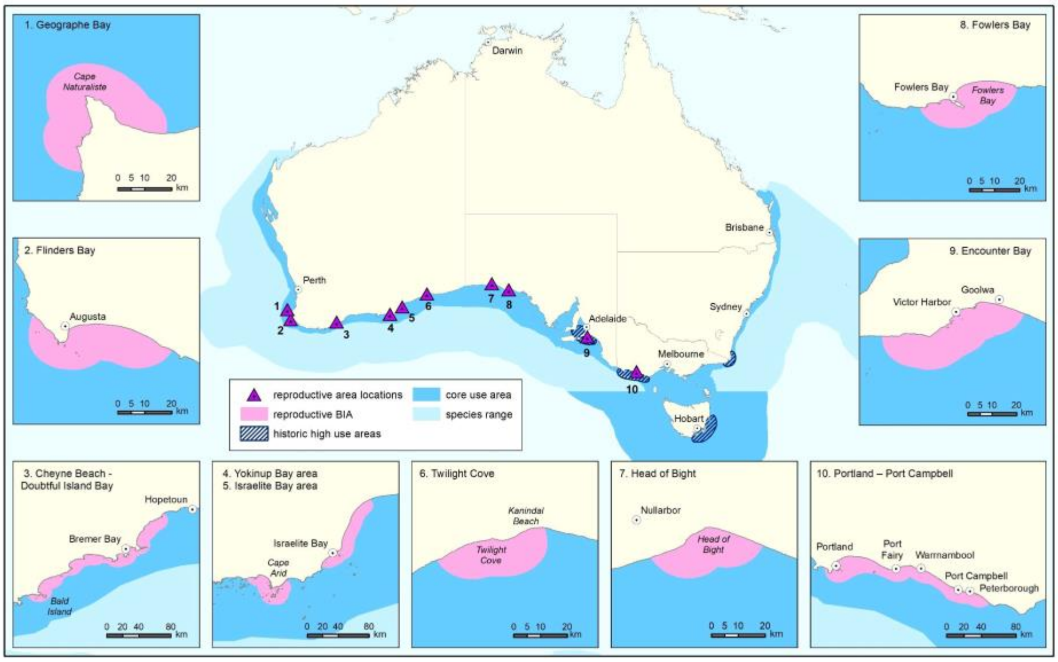
The most recent population estimate of SRW numbers in Australia is approximately 3,500 individuals, comprised of approximately 3,200 individuals in the west and around 270 individuals in the east (Bannister, 2017; Smith *et al*., 2019; Stamation *et al*., 2020). The western population is increasing at a rate of approximately 6% per annum (Smith *et al*., 2020), and the eastern population at a rate of approximately 4.7% per annum (Stamation *et al*., 2020).

SRW coastal calving/nursery grounds occur in shallow sloping sandy bottom bays (Elwen & Best, 2004; Pirzl, 2008) in coastal waters between 16°S and 52°S (IWC, 2010). SRWs visit the sheltered bays off the southern Australian coastline between May and October each year to calve, mate and rest (CoA, 2022). However, occasionally individuals arrive as early as April and depart as late as November (CoA, 2022). In coastal habitats, SRWs usually occur within 1 km of the shore where they aggregate in discrete areas at elevated densities (**Figure 33,** CoA, 2012; CoA, 2022). There is some spatial segregation of cohorts with mother-calf pairs typically occurring in shallower more sheltered water than unaccompanied adults; noting that as calves grow the range of mother-calf pairs increases (CoA, 2022). Depth appears to be the most influential determinant for habitat selection, with whales preferentially occupying water depths less than 10 m at coastal aggregation areas (Pirzl, 2008).

Peak abundance of SRW in coastal aggregation areas occurs mid-July to end-August (Charlton *et al*., 2019). Pregnant females generally arrive in June and depart with calves in September (CoA, 2022). Mother-calf pairs remain at the calving grounds for 2 – 3 months (Burnell and Bryden, 1997). The presence of unaccompanied whales is characterised by a higher degree of temporal variability (Burnell and Bryden, 1997; Charlton *et al*., 2019). Movement of calving and non-calving adults has been recorded across broad distances both within and between seasons (Pirzl *et al*., 2009; Watson *et al*., 2021). There is no evidence that mothers are feeding during the initial months of lactation at calving/nursery grounds (Miller *et al*., 2012). This species typically has a three-year calving cycle; a resting year with no migration follows the year of calving, then a mating year (Brandão *et al*., 2011). Mating is thought to occur away from the calving grounds, and potentially at feeding grounds (Watson *et al*., 2021). Calving interval occasionally extends to five years (CoA, 2022), and at the largest calving area in South Australia (the Head of the Bight), mean calving interval has increase during the 2015 – 2021 monitoring period from three to four years (Charlton *et al.,* 2022). At this same location neonatal mortality is estimated to be 3% during the first three months of life (Burnell, 1999).

Ten reproductive areas have been identified across the southern coast of Australia (**Figure 33;** COA, 2022), the largest of these being the Head of Bight in South Australia, and Doubtful Island Bay and Israelite Bay in Western Australia (CoA, 2012). In VIC (and of greatest relevance to the OA), a reproduction area occurs between Portland and Port Campbell (shown as Area 10 on **Figure 33**). Logans Beach, Warrnambool (approximately 59 km north-northeast of the OA) is the largest aggregation to occur in this reproductive area, with 51 individual SRWs sighted at this location between 1995 and 2018, including 15 cow-calf pairs (Watson *et al*., 2021). Other aggregations in this area also occur at Portland, Port Fairy, Port Campbell, and Peterborough located approximately 42 – 64 km from the OA. SRWs consistently use these areas for calving in varying densities (CoA, 2022). SRWs are known to reside in reproductive areas for three to four months (Charlton, 2017).

The draft SRW Recovery Plan (CoA, 2022) states that reproductive areas are "*important for SRW recovery as they contribute to overall population increases in abundance, maintenance of genetic diversity (given site fidelity may lead to small-scale genetic differences) and expanding habitat occupancy*".



NOTE: 'Reproductive BIAs' shown here must be considered as indicative only until the Draft National Recovery Plan for SRW has been finalised.
Source: Commonwealth of Australia, 2022

Figure 33 SRW Reproductive Area Locations

It is noteworthy that the 15 females identified from Logans Beach produced at least 56 calves from 1995 to 2018 (Watson *et al.,* 2021). At this calving ground, an average of 2.6 (± 0.3) calves are born each year and the mean calving interval is 3.5 ± 0.2 years; however, this increased to 3.9 ± 0.2 years between 2007 and 2018, suggesting that some females from the eastern population may be calving less or occasionally calving in other areas (Watson *et al*., 2021). Watson *et al*. (2021) report no significant change in the annual abundance of cow-calf pairs in the south-eastern Australia region in more than three decades; and specifically, there has been no increase in the number of mother-calf pairs at Logans Beach (Stamation *et al*., 2020).

Across VIC, SRW sightings are variable but are primarily recorded from the areas identified in **Figure 33** with whales usually having a short residency period at these locations (SWIFFT, 2023). First sightings at aggregation areas in VIC usually occur in May (54%) and June (42%), with the majority of last sightings in September (50%) and October (38%) (SWIFFT, 2023). Understanding the temporal presence of SRW in and around the OA is critical to assessing the potential effects of the Otway Basin 3D MC MSS on this species. To this end, the available SRW data for the southwest VIC coast (as collated in the Victorian Biodiversity Atlas) over the past 10 years is summarised in **Table 28**.

Table 28 Dates and Locations of First and Last SRW Sightings for Southwest VIC (west of Melbourne)

Year	First Sighting of Season		Last Sighting of Season	
	Date	Location	Date	Location
2021	30 May	Port Campbell	29 Sep	Apollo Bay
2020	16 Jun	Portland	16 Aug	Portland
2019	13 Apr	Logans Beach	3 Nov	Warnambool
2018	19 May	Portland	25 Sep	Logans Beach
2017	7 May	Logans Beach	22 Oct	Cape Nelson
2016	21 May	Apollo Bay	29 Aug	Portland
2015	31 May	Logans Beach	11 Sep	Logans Beach
2014	14 Apr	Logans Beach	12 Oct	Logans Beach
2013	30 Mar	Warnambool	5 Oct	Logans Beach

Source: https://vba.biodiversity.vic.gov.au/vba/index.jsp

These records suggest that SRW presence in the SRW Aggregation BIA should be expected from May to September (core aggregation months), with whales sometimes arriving in April and remaining through until October.

Gill *et al*. (2015) carried out aerial surveys of cetaceans from western Bass Strait to the eastern GAB between 2002 and 2013. Although effort within this survey was biased towards coverage of the Bonney Upwelling and the corresponding presence of PBWs, survey effort occurred within all months. Throughout the study, a total of 12 sightings making up 52 individual SRWs were noted, with all sightings made between June and September. No SRWs were observed between October and May. Encounter data per 1,000 km of survey distance for the period through which SRWs were observed is presented in **Table 29**. This data supports the finding that the core aggregation months in the vicinity of the OA occur from May to September. Gill *et al*. (2015) also reported that SRWs occurred in shallower waters than all other cetacean groups, with all sightings of this species occurring in the depth band of 0 – 100 m. SRW mother-calf pairs and mating behaviours were regularly observed through winter months (Gill *et al*., 2015).

Table 29 SRW Encounter Data by Month, Pooled for all Years (2002 – 2013)

Number of whales sighted per 1000 km of survey distance	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0	0	0	0	0	0.8	3.1	6.8	8.8	0	0	0

Source Gill et al., 2015

Little is known about the movement of SRWs between coastal reproductive areas and offshore waters. Historical evidence suggests that SRWs move from the southern feeding grounds towards the east coast of TAS early in the season (April), followed by westward movement through Bass Strait and across the GAB (Dawbin, 1986), with the majority of whales thought to return southwards from WA towards feeding grounds at the end of the season (October to December) (IWC, 2001). Photo identification studies support a seasonal westward movement in coastal habitat and highlight the importance of coastal connecting habitat (DSEWPC, 2012; Watson *et al*., 2021), but direct southerly approaches and departures from the VIC coast cannot be dismissed. However, it is generally accepted that the migration pattern of this species is typified by counter-clockwise movement, whereby animals arrive in the east of Australia in May – July, peak in coastal aggregation areas during July/August and then migrate west along the coast before migrating back to southern feeding grounds in Sept/Oct (Burnell, 2001).

A satellite tagging study conducted from the Head of Bight area (Area 8, **Figure 33**) provided information on the movement of SRWs at the end of the season, with two cow-calf pairs migrating directly south, and one moving west past Albany (Mackay *et al*., 2015). Burnell (2001) reported a within season movement of a single SRW first sighted at Portland on 22 July 1994, and 49 days later sighted at the Head of Bight on 9 September 1994, having travelled a distance of 1,297 km north-west with an average speed of 1.1 km/hr, and further supporting westward movement along the southern Australian coast. Similarly, of seven within-season movements of SRWs between south-eastern and south-western Australia, five were in a westerly direction (Watson *et al*., 2021). The longest within-season movement detected was ~1,600 km by a female moving between Cape Nelson, VIC and Head of Bight, South Australia (Watson *et al*., 2021).

SRWs produce low-frequency social sounds including stereotyped upcalls used as contact calls and other tonal sounds for mate attraction (Parks and Tyack, 2005). Such vocalisations range in frequency from 50 – 600 Hz (Parks *et al*., 2007; 2011) at sound levels from 172 – 187 dB re 1 µPa @1 m (as referenced in Erbe, 2002). Mother-calf pairs produce infrequent low amplitude vocalisations, the nature of these calls are thought to decrease the risk of predation by minimising signals which may be detected by potential predators (Nielsen *et al*., 2019, Parks *et al.,* 2019, Zeh *et al.,* 2022).

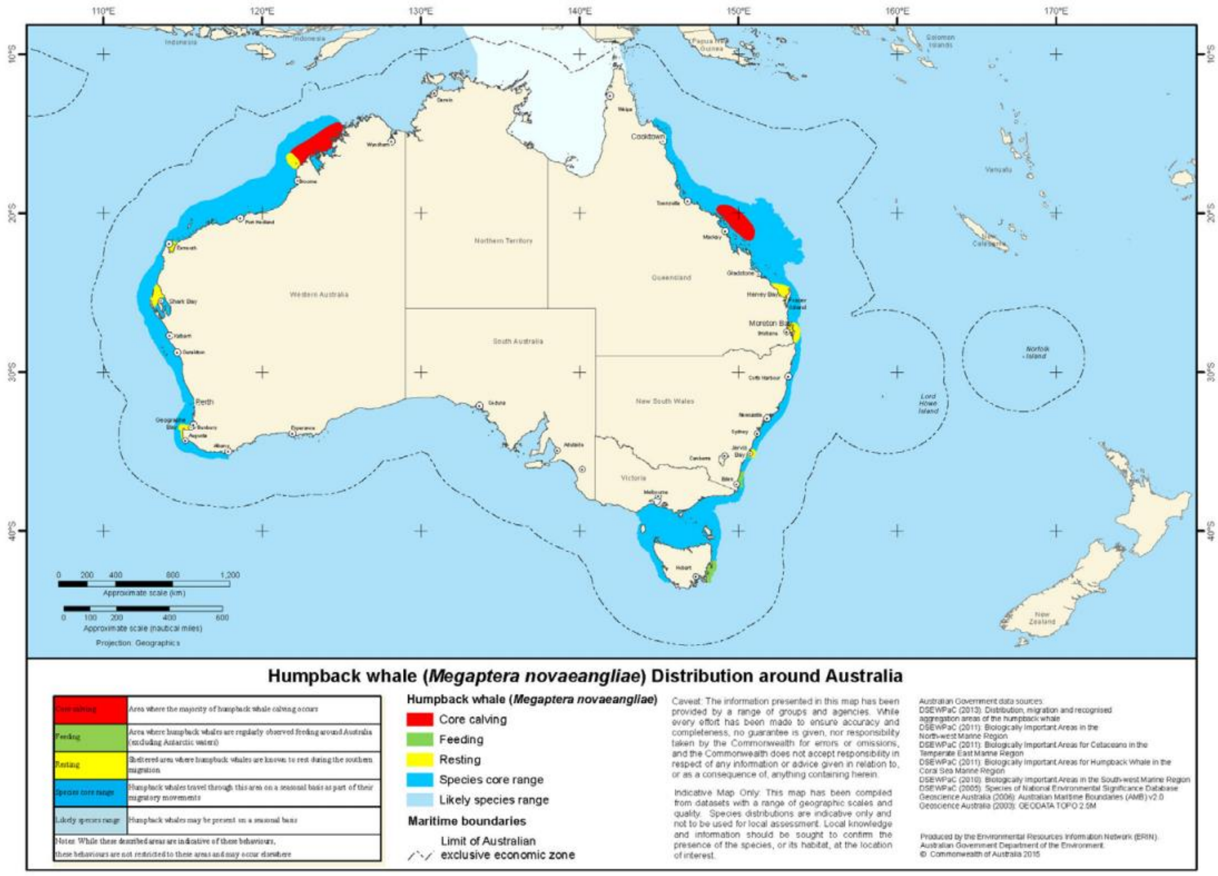
The OA overlaps with the SRW 'known core range' BIA as illustrated in **Figure 24**. In addition, an 'aggregation' BIA (Bridgewater Bay, Portland to east of Logan's beach, Warrnambool) occurs 14 km north of the OA, and the north-western portion of the OA is located approximately 32 km from the SRW migration and resting on migration BIA.

The likelihood of encountering SRWs during the Otway Basin 3D MC MSS has been assessed to be '**moderate**' as there is the potential for some spatial and temporal overlap between the presence of this species and the Otway Basin 3D MC MSS, particularly in the inshore portion of the OA and given that the survey could be underway by the end of the breeding season (September/October).

4.5.6.1.3 Humpback Whale

The humpback whale (*Megaptera novaeangliae*) is widely distributed in all oceans. Humpback whales undertake the longest migration of any mammal (Jackson *et al.*, 2014). They are seasonal migrants that move between low latitude winter breeding grounds and mid- to high-latitude productive summer feeding grounds (Pomilla and Rosenbaum, 2005; Robbins *et al*., 2011; Chittleborough, 1965; Dawbin, 1966). Humpback whales were hunted to near extinction in Australian waters by the commercial whaling industry throughout the 1950s and early 1960s (Smith *et al*., 2012). Following the cessation of commercial whaling, populations of humpbacks have steadily increased. In Australia, humpback whales are divided into east coast and west coast populations. It is estimated that there are around 35,000 individuals in the west coast population, and around 25,000 individuals in the east coast population. The rate of humpback whale population increase on the east coast of Australia is estimated at around 10 - 11.5% per year (Noad *et al*., 2008), and 9% (Bjeder *et al*., 2016) on the west coast. Humpback whales are currently listed as Least Concern under the IUCN Red List, and in Australia were removed from the EPBC Act 1999 threatened species list in 2022 (DoCCEEW, 2023).

The majority of humpback whales in Australian waters migrate north from May to August, and back towards the Southern Ocean from September to November. West coast humpbacks migrate up the west coast of Australia, as far north as Broome and Kimberley, while east coast humpbacks diverge around TAS and move up the east coast of Australia to Hervey Bay, Queensland (**Figure 34**). Breeding and calving occurs during winter months (June – September) in water depths of 30 – 58 m (Smith *et al*., 2012). Although humpbacks do utilise deep oceanic waters during portions of their migration, off Australia they typically move within the continental shelf boundary or 200 m bathymetry (Jenner *et al*., 2001), within 50 km of the coast (DoCCEEW, 2023).

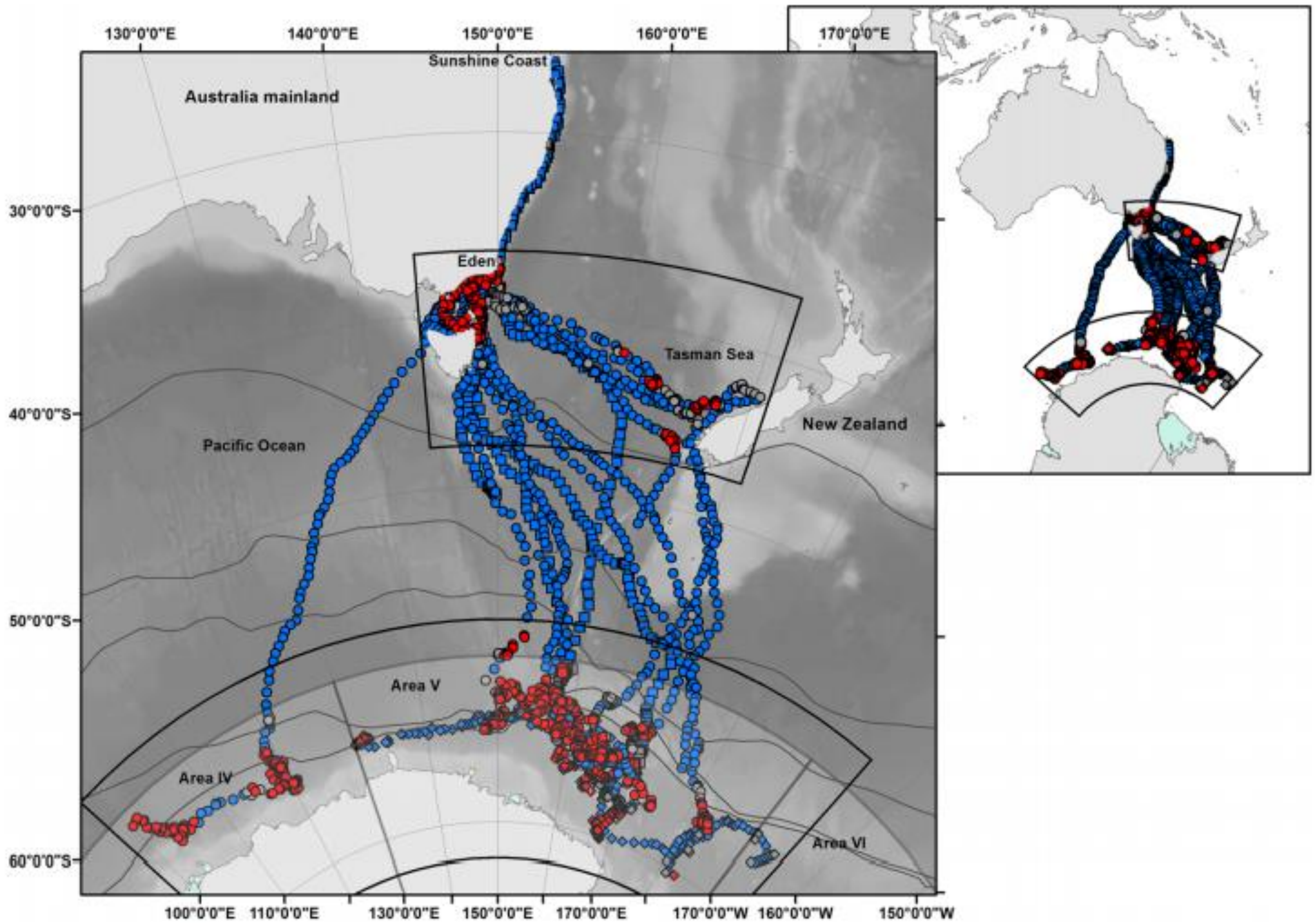


Source: DoCCEEW, 2023

Figure 34 Humpback Whale Distribution around Australia

Humpback whales pass through VIC in the highest numbers during June and July, with some whales returning enroute south in September to October (SWIFFT, 2021c). In VIC, there are reports of humpback whale sightings in all months except February (Warneke, 1995). In South Australia, humpback whales have been observed during all months, and it is thought they are from both the east and west coast populations (DoCCEEW, 2023).

Andrews-Goff *et al.* (2018) used satellite tagging technology to track the southern migration of humpback whales along three migratory trajectories off Australia's east coast (**Figure 35**). The 21 whales tagged off the eastern Australian coast migrated south along the coastline and across the eastern entrance to Bass Strait in October. Twelve whales were also tracked in November moving south along the east coast of TAS, while one whale utilised the western coast of TAS where it continued in a southwest direction into the Pacific Ocean before heading towards Antarctic feeding grounds. Seven whales travelled eastwards into the Tasman Sea, with three animals spending time off the southwest coast of New Zealand (Andrews-Goff *et al.,* 2018). All migrating humpbacks with transmitting tags had arrived at Antarctic feeding grounds by January (Andrews-Goff *et al.,* 2018). The tracks recorded by Andrews-Goff *et al.* (2018) agree with those recorded in previous studies such as Gales *et al.* (2009). While on southern migrations off the headlands of the southern coastline of Queensland and NSW, the migratory corridor is narrow, with whales passing within 5 km of land (Noad *et al.,* 2008). Whales on northern migrations tend to use more offshore waters (Noad and Cato, 2001).



Source: Andrews-Goff *et al.* (2018)

Figure 35 Migration Pathways for Humpback Whales Satellite-Tagged off the Eastern Coast of Australia – Dot Colours Show Recorded Behavioural State; Red ('Search'), Blue ('Transit'), Grey ('Uncertain')

Feeding by humpback whales in Australian waters was initially thought to be opportunistic (Stockin and Burgess, 2005); however, recent satellite tracking suggests that humpback whales temporarily suspend migration to forage (Andrews-Goff *et al*., 2018). Recently identified supplemental feeding areas (i.e. those not at Antarctic feeding grounds) have been identified through Bass Strait, along the east coast of Australia, and within the eastern Tasman Sea (e.g. Stockin and Burgess, 2005; Stamation *et al.,* 2007; Andrews-Goff *et al*., 2018). Gill *et al*. (2015) observed a juvenile humpback whale lunge feeding in the Bonney Upwelling; and during late September to early October 2020, humpback whales were observed feeding off Portland (SWIFFT, 2021c).

Both male and female humpbacks produce communication calls, but only males emit the long, loud, and complex 'songs' associated with breeding activities. Dunlop *et al*. (2007) recorded social vocalisations of migrating east Australian humpbacks and recorded frequencies ranging from <30 Hz to 2.5 kHz over 34 different vocalisation types. The source level of singing humpback whales ranges from 123 – 183 dB re 1 µPa @ 1 m (Dunlop *et al.,* 2013). Surface-generated social sounds (e.g. breaches, pectoral slaps, and tail slaps) are also generated by humpback whales and are thought to have a communicative function (Dunlop *et al.,* 2010). These surface-generated sounds have been reported to be in the range of 133 – 171 dB re 1 µPa @1 m (Dunlop *et al.,* 2013).

There are no known BIAs (feeding, calving and resting) or migratory routes for humpback whales within or adjacent to the OA. A foraging BIA is located within the EMBA, approximately 640 km northeast of the OA. However, humpback whales may be encountered throughout the OA during both their north- (June – July) and south-bound (September – October) migrations.

Humpback whales have been assessed to have a '**moderate**' likelihood of occurring within the OA during the Otway Basin 3D MC MSS. The Otway Basin 3D MC MSS will occur temporally and spatially proximate to migratory pathways, particularly during the southward migration period (September to October).

4.5.6.1.4 Fin Whale

Fin whales (*Balaenoptera physalus*) have a global distribution and are found in offshore waters throughout the world (NOAA, 2018). Like other baleen whales, they head to high latitudes (between 50°S and 65°S) to feed over the summer months (Miyashita *et al*., 1995) and move to warmer lower latitude waters during winter to breed. Their migration paths are oceanic, and do not obviously follow coastlines (Bannister *et al.,* 1996). In the Southern hemisphere, fin whales were depleted to just 2% of their population size during the era of widespread commercial whaling (AMMC, 2019). Fin whales are currently listed as Vulnerable under the IUCN Red List, and in Australia they are listed as Vulnerable and Migratory under the EPBC Act 1999.

The distribution of fin whales in Australian waters is mainly known from stranding events and historic whaling records, with one stranding reported in VIC (Larcomb *et al*., 2002) and two strandings reported in South Australia (Bannister *et al*., 1996). Fin whales have been sighted inshore of the Bonney Upwelling in VIC waters during aerial surveys in summer and autumn months (Gill, 2002), between November and May (Gill *et al*., 2015). Within the Bonney Upwelling, fin whales were distributed in shelf waters, in water depths of 162 ± 90 m (sample size seven individuals) (Gill *et al*., 2015). Whales were observed to be feeding, with a fin whale bubble cloud seen near krill (Gill *et al*., 2015). Most fin whale sightings were of adult whales, although a cow-calf pair was sighted on one occasion, suggesting that the region may be used for breeding or rearing young (Gill *et al*., 2015).

Fin whale communication vocalisations have been described as short (<1 second) down-swept tones, between 28 and 15 Hz at source levels of 189 ± 4 dB re 1 µPa @1 m (Širović *et al*., 2007). Underwater acoustic recordings have been collected approximately 50 km south-west off Portland from 2009 to 2018. In analysing this data (2002 – 2019), Aulich *et al*. (2022) found that fin whale detections showed yearly variations but occurred in the temporal window from July to October at a low rate (detected in just 0.02 % of total recording hours; Aulich *et al*., 2019). This indicates an inconsistent and irregular presence of fin whales in this region and suggests that few animals migrate to the south coast of Australia (Aulich *et al*., 2022).

The extent of occurrence and areas of occupancy of fin whales in south-east coast Australian waters is unknown due to the rarity of sightings records, however given the wide-ranging nature of this species, the confirmed sightings in the Bonney Upwelling and the acoustic detections in waters off Portland, there is a '**moderate**' likelihood of encountering fin whales during the Otway Basin 3D MC MSS, particularly during summer and autumn months (from November through to May).

4.5.6.1.5 Sei Whale

Sei whales (*Balaenoptera borealis*) are found throughout the world's oceans but prefer temperate waters and offshore areas. Their preferred water temperature is between 8 and 18°C (Horwood, 2009) which is warmer than that preferred by most other baleen whales (Mizroch *et al.*, 1984). The sei whale is one of the least studied great whale species, and the current status of most populations is poorly known, as is the current abundance estimate for the southern hemisphere and Australian waters (DEH, 2005). Sei whales are currently listed as Endangered under the IUCN Red List, and in Australia they are listed as Vulnerable and Migratory under the EPBC Act 1999.

The movements and distributions of sei whales are unpredictable and not well documented, in part because sei whales are similar in appearance to Bryde's whales, which has resulted in confusion about distributional limits and frequency of occurrence, particularly in warmer waters where Bryde's whales are more common (DEH, 2005). It is thought that sei whales follow the same general migration pattern as most baleen whales; movement from low latitude feeding grounds to higher latitude feeding grounds, although the timing is generally later, and it is largely understood that they do not migrate to such high latitudes to feed (DEH, 2005). In the Southern Hemisphere, breeding occurs in tropical and subtropical waters between April and August, however there are no known mating or calving areas in Australian waters (DoCCEEW, 2023).

Sei whales do not often occur near coasts and sightings are infrequently reported from Australian waters (Bannister *et al*., 1996). However, a small number of sightings have been reported from VIC waters and those off TAS (Kato *et al.,* 1996; Gill, 2002), mainly during summer and early autumn months (Gill, 2002). A total of 12 sei whales were sighted during annual aerial surveys (from 2002 – 2013) 20 – 60 km offshore on the continental shelf in the Bonney Upwelling (Miller *et al*., 2012) during November to May (Gill *et al*., 2015). On one occasion, a cow-calf pair was sighted, and feeding behaviour was observed on five occasions (Gill *et al*., 2015). Additionally, sei whales have been reported 200 NM south-west of Port Lincoln in December, and a concentration of sei whales was reported as the western end of the Bass Strait (Kato *et al*., 1996). Females with calves have also been observed south of TAS (Ensor *et al*., 2002).

Sei whale vocalisations have been recorded as low-frequency down-sweep calls that sweep from 82 to 34 Hz over 1.4 seconds, most often produced as a single call but occasionally as pairs or triplicates (Baumgartner *et al*., 2008). As well as low-frequency tonal and swept calls, McDonald *et al.* (2005) also recorded broadband sounds described as 'growls' or 'wooshes'. The maximum source level of tonal calls recorded by McDonald (2006) was 156 ±3.6 dB re 1 µPa @ 1 m.

The extent of occurrence and areas of occupancy of sei whales in Australian waters is poorly known due to the rarity of sightings records, however the confirmed sightings in the Bonney Upwelling indicate that sei whales may be encountered during the Otway Basin 3D MC MSS. On this basis, the likelihood of encountering sei whales during the Otway Basin 3D MC MSS has been assessed to be '**moderate**'.

4.5.6.1.6 Antarctic Minke Whale

The Antarctic minke whale (*Balaenoptera bonaerensis*) is found throughout the Southern Hemisphere, occupying primarily offshore and pelagic habitats within cold temperate to Antarctic waters between 21°S and 60°S (Bannister *et al*., 1996). This species is currently listed as Data Deficient under the IUCN Red List, and in Australia they are listed as Migratory under the EPBC Act 1999.

Antarctic minkes undergo extensive migrations between summer feeding grounds in Antarctica and winter sub-tropical to tropical breeding grounds (Perrin and Brownell, 2002). The northward range of Antarctic minkes is restricted by the presence of warmer waters extending south along Australia's coasts (DoCCEEW, 2023). Zerbini *et al*. (1997) noted that Antarctic minke whales occupy pelagic waters extending up to 600 m depth while on breeding grounds.

The distribution of Antarctic minke whales off Australia is primarily assumed from incidental sightings and beach-cast animals (DoCCEEW, 2023). Gill *et al*. (2015) reported one sighting of a whale assumed to be an Antarctic minke whale during aerial surveys in South Australian waters (eastern GAB to western Bass Strait) between 2002 – 2013. Based on sighting records, Arnold *et al*. (1987) suggests minke whale abundances in Australian waters peak in July and August.

'Bio-duck' sounds that are characteristic of Antarctic minke whales were recorded in the Perth Canyon, Western Australia during July and August (Erbe *et al*., 2015), and around Scott Reef, north-west of Cape Leveque, Western Australia in July, September and October (McCauley, 2011).

The extent of occurrence and areas of occupancy of Antarctic minkes in Australian waters is unknown due to the rarity of sightings records, however given the offshore distribution of this species, and the possible sighting in the Bonney Upwelling, this species may be encountered during the Otway Basin 3D MC MSS. But based on the paucity of sighting records, the likelihood of encountering minke whales during the Otway Basin 3D MC MSS has been assessed to be '**low**'.

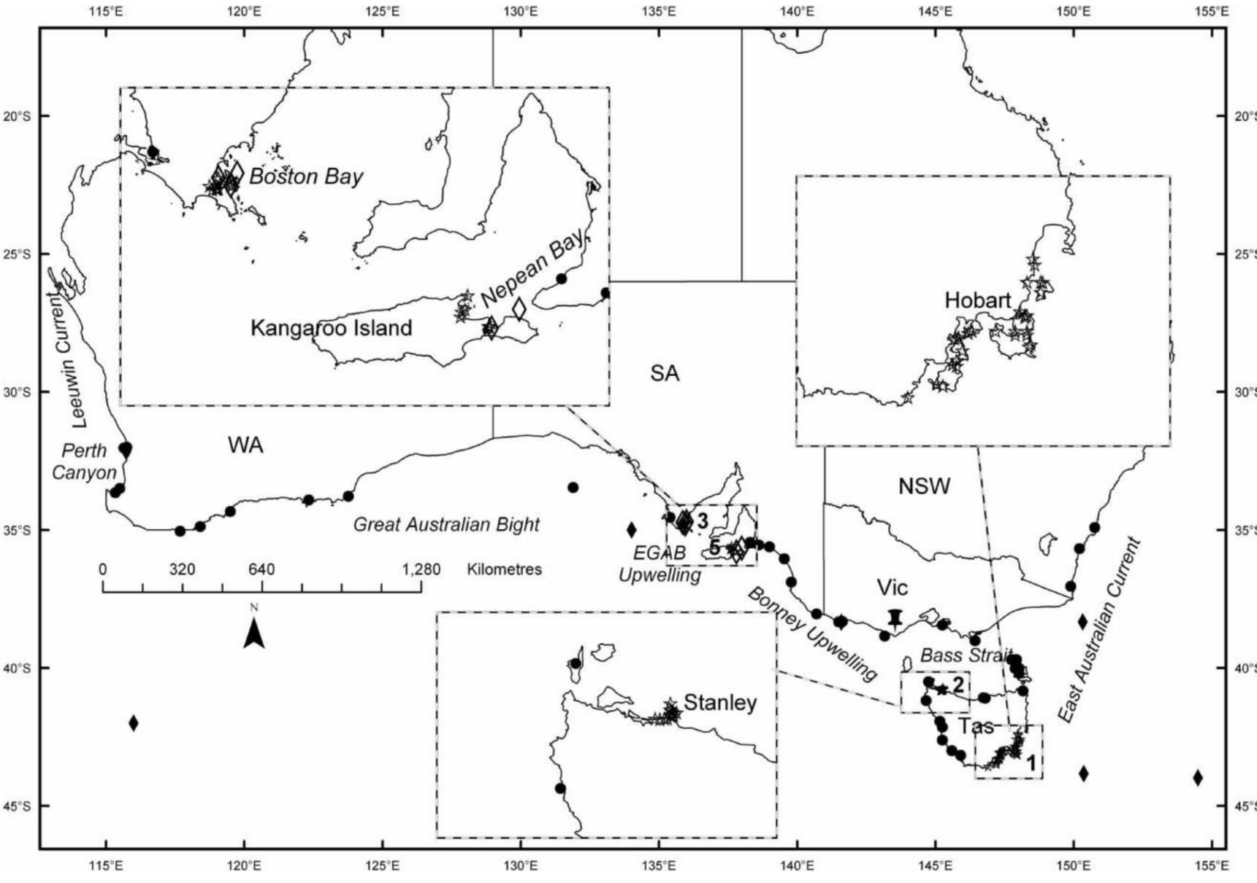
4.5.6.1.7 Pygmy Right Whale

The pygmy right whale (*Caperea marginata*) is found in temperate and sub-Antarctic waters of the Southern Hemisphere preferring surface water temperatures of 5 – 20°C (Kemper, 2002). Pygmy right whales are not known to be migratory, however they may move north/south depending on reproductive and life history status (Kemper, 2002). This species is listed as Least Concern under the IUCN Red List, and in Australia they are listed as Migratory under the EPBC Act 1999.

Pygmy right whales are the smallest, most cryptic and least known of the living baleen whales (Fordyce and Marx, 2012). While pygmy right whales are rarely sighted at sea and most of what is known comes from strandings, there have been more sightings of pygmy right whales in Australian waters than anywhere else in their range (Kemper, 2002). In particular, South Australia and western VIC reported more stranding and sighting events (32% of all Australian records) than other regions on Australia's mainland, and overall had the most sightings of live whales.

In South Australia/West VIC (Bonney Upwelling region), there have been six sightings and 35 carcasses (including strandings, entanglements and intentional killings) recorded for the period 1884 to early 2007 (Kemper *et al*., 2013). Sightings of live whales in this region were almost all very close to shore, within 2 km (Kemper *et al.*, 2013). From this data, Kemper *et al.* (2013) identified a number of coastal 'hot spots' for this species (**Figure** 36); namely Boston Bay and Nepean Bay in South Australia (587 km and 404 km northwest of the OA respectively), and Stanley, northwest TAS (135 km to the east of the OA). Several sighted whales were observed within the hotspots for more than one day, suggesting that these animals were not simply transiting the area. Pygmy right whale sightings were most frequent from September to February, with an additional peak in June (Kemper *et al*., 2013), coinciding with a sighting by Gill *et al*. (2008). Gill *et al*. (2008) reported a single sighting of 100 pygmy right whales in June 2007, approximately 40 km south-south-west of Portland in the Bonney Upwelling in water depths of 150 m, approximately 4 km from the 200 m shelf break. This sighting reportedly contained a range of size classes, including calves, near an area where abundant krill surface swarms were present at the time (Gill *et al*., 2008; 2015). In support of this, Kemper *et al*. (2013) found that pygmy right whales were likely feeding in zooplankton rich areas including the Bonney Upwelling.

Little information is known on the vocalisations of pygmy right whales, although it has been assumed that communication is similar to other baleen whales, in that this species communicates using loud low-pitched sounds (WhaleFacts, 2023). Recordings of a juvenile pygmy right whale documented paired short thump-like pulses or tone bursts with a down-sweep in frequency and decaying amplitude. Most of the energy of this call was between 60 and 120 Hz. Recorded source levels were in the lower end of the range of other baleen whales (Dawbin and Cato, 1992).



Source: Kemper *et al.,* 2013

Figure 36 Distribution of Pygmy Right Whale Stranding's and Sightings off Australia

Given the presence of a pygmy right whale 'hotspots' in waters adjacent to the OA, and the confirmed sightings of this species in the Bonney upwelling, pygmy right whales may be encountered during the Otway Basin 3D MC MSS in nearshore waters. Therefore, the likelihood of encountering pygmy right whales during the Otway Basin 3D MC MSS has been assessed to be '**moderate**'.

4.5.6.2 Cetaceans – Toothed Whales and Dolphins

4.5.6.2.1 Sperm Whale

Sperm whales (*Physeter microcephalus*) have a cosmopolitan distribution throughout deep waters off the continental shelf (i.e. beyond 200 m water depth). While sperm whales have been recorded in all Australian waters (Bannister *et al*., 1996), females and young are restricted to warmer waters north of 45°S, while males travel to and from colder waters and to Antarctic pack-ice (Johnson, 2013). While sperm whales do not undertake large-scale migrations along pre-determined routes, they can and do move considerable distances between foraging locations (Whitehead, 1996). Sperm whales are listed as Vulnerable under the IUCN Red List, and in Australia they are listed as Migratory under the EPBC Act 1999.

Sperm whales tend to inhabit offshore areas with a water depth of 600 m or more and are uncommon in waters less than 300 m deep. Concentrations of sperm whales are found where the sea floor rises steeply from great depth, particularly in submarine canyons and are associated with concentrations of major food in areas of upwelling (Bannister *et al.*, 1996; Moors-Murphy, 2014).

Key locations for sperm whales in southern Australia include the area between Cape Leeuwin and Esperance, Western Australia, the region south-west of Kangaroo Island, South Australia, and deep waters off the TAS west and south coasts (DoCCEEW, 2023). Deep canyons off the South Australia coast and associated upwellings are known to provide a food source for sperm whales. Sperm whales are deep and prolonged divers and can therefore feed throughout the entire water column, even in very deep areas. However, they seem to forage mainly on or near the bottom, often ingesting stones, sand, sponges, and other non-food items (Rice, 1989; Whitehead *et al*., 1992). Watkins *et al*. (1993) noted that sperm whales have been recorded to dive to depths exceeding 1,185 m for over one hour whilst feeding.

Aerial surveys in continental shelf and slope waters off southern Australia (eastern GAB to western Bass Strait) from 2002 – 2013 recorded a total of 34 sperm whale sightings, with 66 individual sperm whales sighted (Gill *et al*., 2015). The greatest number of sightings occurred in October and November, with no sightings between June and September (Gill *et al*., 2015). Only adult sperm whales were sighted, with 68% of sightings of solitary males, and the remaining 32% were groups of 2 – 12 similarly sized animals (Gill *et al*., 2015). A previous 2D seismic survey over the OA recorded five sightings of 17 sperm whales, mainly on the continental slope (Seiche Environmental, 2020; **Figure 27**).

This species is reliant on echolocation to locate prey and for navigation. The echolocation clicks that sperm whales use during foraging enable them to determine the direction and distance of prey (Ocean Research Group, 2015). Clicks are also produced as a means of communication, to identify members of a group and to coordinate foraging activities (Andre and Kamminga, 2000). Sperm whale clicks have been reported to be multi-pulsed and broadband, ranging in frequency from 0.2 – 32 kHz (Backus and Schevill, 1966). Clicks from foraging male sperm whales have been recorded with source levels up to 236 dB re 1 µPa @ 1 m (Madsen *et al.,* 2002; Møhl *et al.,* 2003).

There are no BIAs for sperm whales within the OA, however a foraging BIA is located within the EMBA, approximately 326 km northwest of the OA (**Figure 25**). The foraging BIA is utilised by sperm whales throughout the year, with whales most abundant during August and September. The likelihood of encountering sperm whales during the Otway Basin 3D MC MSS has been assessed to be '**moderate**' based on their cosmopolitan distribution in offshore waters and the presence of sperm whale concentrations in the vicinity of the OA.

4.5.6.2.2 Killer Whale

Killer whales (*Orcinus orca*) (also known as orca) are distributed throughout all marine regions from the equator to polar waters (Reeves *et al.*, 2017); however, they are most numerous in coastal waters and cooler regions where productivity is high (DoCCEEW, 2023). There are no population estimates for the killer whale, globally or within Australia (DoCCEEW, 2023). The killer whale is currently listed as Data Deficient under the IUCN Red List, and in Australia they are listed as Migratory under the EPBC Act 1999.

In Australia, killer whale sightings have been reported from all states, with concentrations reported from around TAS, with animals also frequenting waters off VIC (Ling, 1991). They are often observed along the continental slope and on the shelf, particularly around seal colonies (Ross, 2006). High numbers of killer whale strandings have been reported within the SEMR, suggesting regionally significant populations may be present (CoA, 2015). Killer whales are known to make seasonal movements and although little is known of movement patterns, it is likely that the presence of killer whales in the OA is highest in winter months.

In VIC, killer whales were sighted in 2015, 2016, 2017, 2018 and 2019, including off Portland in August 2019 (SWIFFT, 2021b). Gill *et al*. (2015) reported six sightings, comprising 21 individual killer whales (mean group size 3.5 ± 2.8 whales), during aerial surveys in South Australian waters (eastern GAB to western Bass Strait) in 2002/2003, 2003/2004, 2006/2007 and 2011/2012. Sightings occurred predominantly in March and May, with additional sightings in July and December. Killer whales were predominantly sighted on the shelf close to the shelf break, in an average water depth of 171 ± 135 m (Gill *et al*., 2015). In South Australia, killer whale sightings were mostly coastal, with concentrations of sightings found along the west coast of Eyre Peninsula and around Kangaroo Island (Kemper, 2008). Sightings were reported in all months except August, with sightings most frequent in July (Kemper, 2008).

Echolocation characteristics vary between groups of whales and are thought to reflect the target prey species of a particular group (Barrett-Lennard *et al*., 1996). Whistles have an average dominant frequency of 8.3 kHz (Thomsen *et al*., 2001) and variations of these whistles (often referred to as dialects) have been documented between pods (Deecke *et al*., 2000).

There is no known foraging or breeding areas for killer whales within or adjacent to the OA, however given the frequent sightings of killer whales in South Australia and VIC waters, and the confirmed sightings of killer whales in the Bonney Upwelling, killer whales may be encountered during the Otway Basin 3D MC MSS. The likelihood of killer whales being encountered during the Otway Basin 3D MC MSS has been assessed as '**moderate**'.

4.5.6.2.3 False Killer Whale

False killer whales (*Pseudorca crassidens*) are widespread in deep tropical and warm temperate waters (Odell and McClune, 1999). Although false killer whales are widely distributed throughout Australia (based on stranding records), they are not considered to be abundant (Ross, 2006). The false killer whale is currently listed as Near Threatened under the IUCN Red List and are not listed under the EPBC Act 1999.

High stranding numbers of false killer whales in the SEMR (including in VIC, South Australia and TAS) suggest that regionally significant populations may occur in this region (CoA, 2015). Trends in stranding events suggest a seasonal movement inshore or along the continental shelf on Australia's south-east coast between May and September (Nicol, 1987; Bannister *et al*., 1999). However, during aerial surveys off continental shelf and slope waters of southern Australia (eastern GAB to western Bass Strait) from 2002 – 2013, no false killer whale detections were made (Gill *et al*., 2015). False killer whales utilise deep offshore waters and sometimes deep coastal waters where the continental shelf is narrow (Culik, 2005).

False killer whales are extremely vocal with a diverse repertoire consisting of click trains, burst-pulse sounds, and whistles. Peak frequencies of false killer whale sounds recorded from captive animals ranged from 3 to 22 kHz (Murray *et al*., 1998).

No biologically important habitat has been reported in proximity of the OA, therefore the likelihood of encounter of false killer whales during the Otway Basin 3D MC MSS has been assessed as '**low**'.

4.5.6.2.4 Long-finned Pilot Whale

Long-finned pilot whales (*Globicephala melas*) are widespread and relatively common throughout the Southern Hemisphere (Ross, 2006). They inhabit temperate and sub-Antarctic deep oceanic waters and zones of high productivity along the continental slope, venturing into shallower waters (<200 m) in search of prey (Ross, 2006). The long-finned pilot whale is currently listed as Least Concern under the IUCN Red List and are not listed under the EPBC Act 1999.

High numbers of long-finned pilot whales have stranded along the VIV and TAS coasts (Ross, 2006), suggesting that regionally significant populations may be present (CoA, 2015). Mass stranding events along the Australian coast suggest a seasonal occurrence, with events historically occurring from September – March, with 60% of those occurring from December to March (Bannister *et al*., 1996).

Aerial surveys over continental shelf and slope waters off southern Australia (eastern GAB to western Bass Strait) from 2002 – 2013 recorded a total of 40 long-finned pilot whale sightings, with 1,853 individuals sighted (Gill *et al*., 2015). All sightings occurred in the months between November and May, with no sightings between June and October (Gill *et al*., 2015). A previous 2D seismic survey over the OA from January to April 2020 recorded two sightings of this species (Seiche Environmental, 2020; **Figure 27**).

Pilot whales are known to be highly vocal when socialising at the surface (Jensen *et al.,* 2011), with vocalisations ranging from simple whistles while resting at the surface to complex whistles and pulses sounds during active behaviours (Weilgart and Whitehead, 1990). Calls of deep-diving pilot whales have been recorded with median peak frequencies of 3.9 kHz (Jensen *et al.,* 2011).

Due to the relatively high number of stranding records for the VIC coast, there is potential that the OA is spatially and/or temporally proximate to areas that provide important habitat for this species. As a result, the likelihood of encountering pilot whales during the Otway Basin 3D MC MSS has been assessed to be '**moderate**'.

4.5.6.2.5 Dusky Dolphin

The dusky dolphin (*Lagenorhynchus obscurus*) occurs coastally throughout the Southern hemisphere, mostly in temperate and sub-Antarctic zones between about 26°S and 55°S (DoCCEEW, 2023). They are presumed to be primarily an inshore species; however, they may be pelagic at times (Ross, 2006). Currently, dusky dolphins are listed as Least Concern under the IUCN Red List, and in Australia they are listed as Migratory under the EPBC Act 1999.

Although identified as potentially present within the SEMR (CoA, 2015), they are considered to be rare in Australian waters (Ross, 2006). Indeed, dusky dolphin presence in Australia, is known only from 13 reports since 1982 (DoCCEEW, 2023). However, available data suggests that hey occur across southern Australia, from Western Australia to TAS, with confirmed sightings near Kangaroo Island, South Australia and off TAS and VIC, and unconfirmed sightings south of continental Australia (Ross, 2006; DoCCEEW, 2023). It is noteworthy that all sightings of dusky dolphins in Australian waters have been correlated with abnormally warm sea surface temperatures (more than 0.5 °C above normal temperature) (Gill *et al*., 2000). Dusky dolphins are resident inshore for much of year but are known to seek out colder water (<18 C) as inshore temperatures rise in summer (Ross, 2006). Mating and calving is presumed to occur in summer, although no calving areas are known in Australian waters (Ross 2006).

The extent of occurrence and areas of occupancy of dusky dolphins in Australian waters is unknown due to the rarity of sightings records, however given their presence across southern Australia, dusky dolphins may be encountered during the Otway Basin 3D MC MSS. However, the likelihood of encounter of this species during the Otway Basin 2DMC MSS has been assessed as '**low**'.

4.5.6.2.6 Common Dolphin

Common dolphins (*Delphinus delphis*) occur over continental shelf and pelagic waters of the Atlantic and Pacific Oceans (Reeves *et al*., 2002). Their occurrence in Australian waters is poorly studied, with stranding and incidental capture records the main sources of information (Filby *et al.,* 2010). Common dolphins are listed as Least Concern under the IUCN Red List and are not listed under the EPBC Act 1999.

Filby *et al.* (2010) carried out the first distribution and abundance survey for common dolphins in South Australia waters. Although common dolphins were observed in all months surveyed (suggesting that populations are resident), a summer seasonality to sightings was evident, with more encounters and larger groups recorded from December to April (Filby *et al*., 2010). Dolphins were only found in water depths less than 40 m (Filby *et al.,* 2010). While this survey was carried out to the west of the OA, it provides an indication to the potential distribution and seasonality of common dolphins within the OA. Based on the high numbers of common dolphin stranding events, including a mass stranding of 34 animals in VIC (Ross, 2006), regionally significant populations of common dolphins may be found in the SEMR (CoA, 2015).

Aerial surveys over continental shelf and slope waters off southern Australia (eastern GAB to western Bass Strait) from 2002 – 2013 recorded a total of 384 dolphin sightings, and while species could not always be reliably identified these sightings were assumed to be either common dolphins or bottlenose dolphins, and most likely the sightings are a mix of both species (Gill *et al*., 2015). Dolphin sightings occurred in all months except August and September (Gill *et al*., 2015). A previous 2D seismic survey over the OA from January to April 2020 recorded multiple sightings of this species (Seiche Environmental, 2020; **Figure 27**).

Common dolphins are highly vocal animals, and use a variety of vocalisations including whistles, echolocation click-trains, burst pulse calls (Richardson *et al.,* 1995; Soldevilla *et al,* 2008), and other non-whistle pulsed sounds referred to as barks, yelps, or squeals (Ridgway, 1983). The average frequency and length of whistles are 10 – 14 kHz and 0.27 seconds, respectively (Petrella *et al*., 2012).

Common dolphins have been assessed as having a '**moderate**' likelihood of encounter during the Otway Basin 3D MC MSS as although the majority of the OA occurs in water depths greater than 200 m, common dolphins are expected to be encountered in the inshore portions of the survey as occurred during the previous Otway Basin 2D MC MSS (**Figure 27**).

4.5.6.2.7 Bottlenose Dolphin

Bottlenose dolphins (*Tursiops truncatus* and *Tursiops aduncus*) are widespread in cold temperate and tropical seas, where they inhabit a range of habitats including bays, lagoons, estuaries, open coasts, and pelagic waters (Möller *et al.,* 2002). The distribution on bottlenose dolphins is continuous around mainland Australia, but the taxonomy of many populations is unclear. Indeed, the taxonomy of the *Tursiops* genus is currently under review and recently a novel species of bottlenose dolphin (*Tursiops australis*) has been identified to inhabit inshore waters of VIC (Möller *et al.,* 2008). Bottlenose dolphins are listed as Least Concern (*Tursiops truncatus*) and Near Threatened (*Tursiops aduncus*) under the IUCN Red List and no *Tursiops* species are currently listed under the EPBC Act 1999.

In Australian waters bottlenose dolphins are usually found in depths >30 m (Hale *et al*., 2000; Kemper, 2004). Bilgmann *et al*. (2007) suggests that female bottlenose dolphins tend to be resident to particular areas, while males' range further. High numbers of bottlenose dolphin strandings have occurred in the SEMR, suggesting that regionally significant populations may exist here (CoA, 2015).

Aerial surveys over off southern Australia (eastern GAB to western Bass Strait) from 2002 – 2013 recorded a total of 384 dolphin sightings, and while species could not always be reliably identified these sightings were assumed to be either bottlenose dolphins or common dolphins, but most likely the sightings events are a mix of both species (Gill *et al*., 2015). Dolphin sightings occurred in all months except August and September (Gill *et al*., 2015). On four occasions dolphins were positively identified to be bottlenose dolphins and these sightings occurred in September, November, and December. A previous 2D seismic survey over the OA from January to April 2020 recorded one sighting of this species (Seiche Environmental, 2020; **Figure 27**).

Bottlenose dolphins produce 'clicks' which are used for echolocation purposes (0.8 – 24 kHz) and 'whistles' which are used as a form of communication (40 – 130 kHz).

The OA mostly occurs in waters deeper than those preferred by bottlenose dolphins; therefore, the likelihood of bottlenose dolphins being encountered during the survey has been assessed as '**low**'.

4.5.6.3 Pinnipeds (Otariids – Sea Lions and Fur Seals)

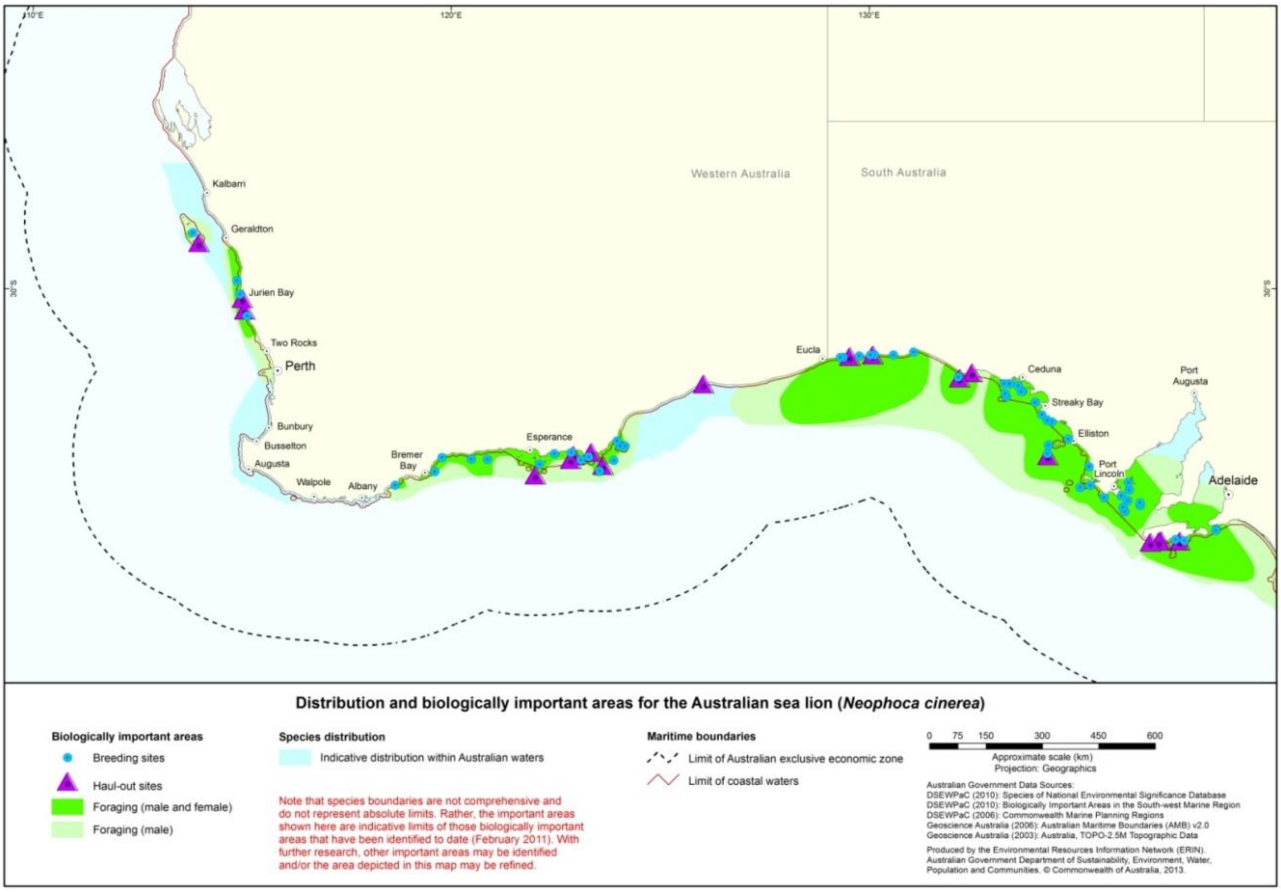
4.5.6.3.1 Australian Sea Lion

The Australian sea lion (*Neophoca cinerea*) is the only pinniped species endemic to Australia. The contemporary distribution of Australian sea lions is restricted to Southern and Western Australia (Shaughnessy *et al*., 2011), and the current breeding distribution occurs mostly on islands of South Australia and Western Australia, with only a number of small mainland breeding sites at the base of cliffs (between Pages Islands just off the east side of Kangaroo Island to Easter Island in the Abrolhos Islands, Western Australia) (Goldsworthy *et al*., 2021) (**Figure 37**). The range of this species was severely restricted following commercial sealing in the late eighteenth and early nineteenth century, with the historical range thought to have extended into Bass Strait (Ling, 1999). Currently, the Australia sea lion is listed as Endangered under the IUCN Red List, and in Australia they are listed as Endangered under the EPBC Act 1999.

Australia sea lions are unique among pinnipeds in that they have a non-annual breeding cycle of around 17 – 18 months, with the longest gestation of any pinniped of up to 14 months (Goldsworthy *et al*., 2021). In addition, this species has a temporally asynchronous breeding cycle (i.e. the period of mating and parturition in one colony will occur at a different time to that in another colony. Females typically remain within 60 km of their natal site, while males disperse approximately 200 km from natal sites (Campbell, 2003).

There is evidence of significant declines in abundance across parts of the Australian sea lions' range, with total population estimates ranging between 10,000 to 15,000 individuals (Goldsworthy *et al*., 2015). Goldsworthy *et al*. (2021) report a decline in pup abundance of 2% per annum, with an overall decline of 64% over three generations (~42 years). Pup production is c.2,700 per annum, of which 82% occur in SA (Goldsworthy *et al*., 2021).

Australian sea lions are known to forage on the continental shelf, most commonly in depths of 20 – 100 m in Commonwealth waters adjacent to breeding sites (Shaughnessy, 1999) (**Figure 37**). Foraging trips average around 60 km from the colony, with a maximum distance of around 190 km when over shelf waters (Hamer *et al*., 2011). Australian sea lions are benthic foragers, primarily feeding on the seabed (Goldsworthy *et al*., 2021). Their diet is varied, and includes fish, cephalopods, sharks, rock lobster, and sea birds (Shaughnessy, 1999).



Source: CoA, 2013

Figure 37 Distribution of the Australian Sea Lion

The OA is located east of the distributional range for Australian sea lions; hence there is no overlap between the OA and any BIAs for this species. However, two foraging BIAs for Australian sea lions are located within the EMBA; a foraging BIA (male) is located approximately 97 km northwest of the OA and a foraging BIA (male and female) is located approximately 312 km northwest of the OA (see **Figure 26**). The closest breeding colony to the OA is located within the Pages Island group, over 360 km northwest of the OA (DoCCEEW; 2023).

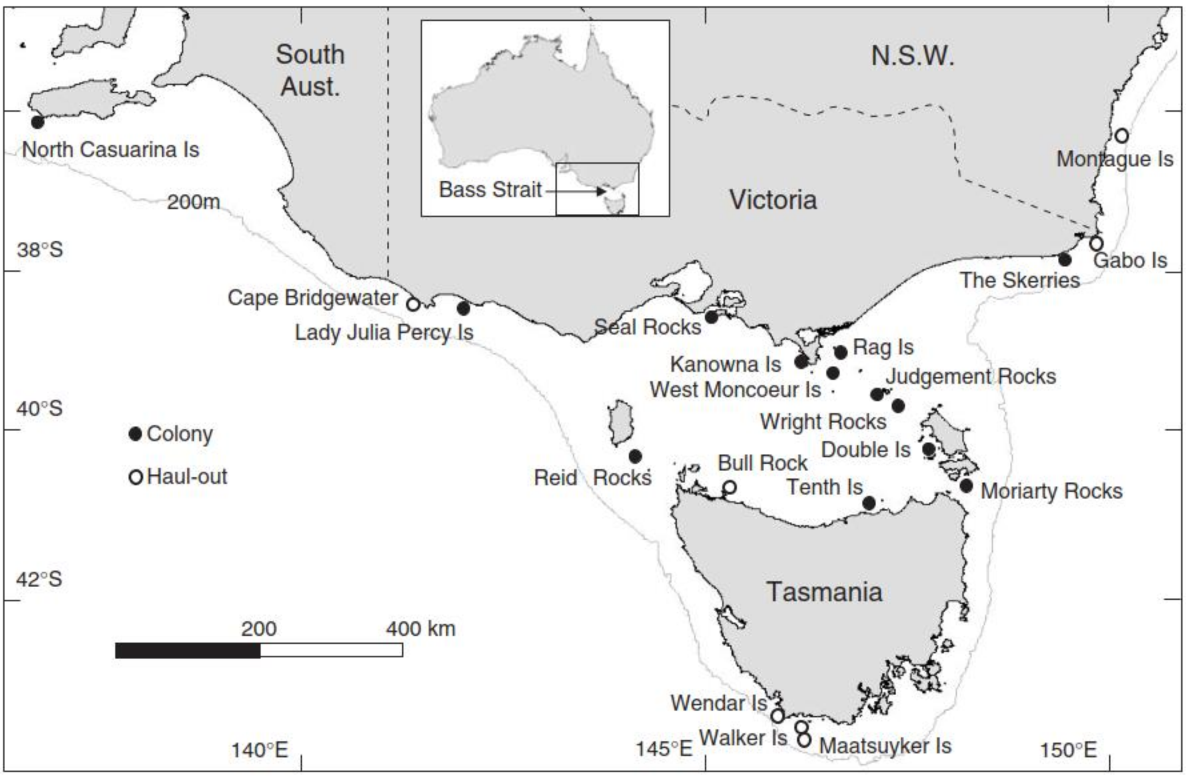
As the OA occurs outside the typical distributional range for Australian sea lions, the likelihood of encountering this species during the Otway Basin 3D MC MSS has been assessed as '**low**'.

4.5.6.3.2 Australian Fur Seal

The Australian fur seal (*Arctocephalys pusillus*) utilises rocky island habitat that includes flat, open terrain. The population of Australian fur seals was severely reduced during commercial sealing operations in the 1800s and early 1900s (Warneke and Shaughnessy, 1985), and the population is still in the recovery phase. This species is currently listed as Least Concern under the IUCN Red List, and they are not listed under the EPBC Act 1999.

The most recent population estimate for this species is 120,000 individuals (Kirkwood *et al*., 2010). Pup production is largely restricted to northern Bass Strait (Kirkwood *et al*., 2010) where ten established breeding colonies occur (**Figure 38**), six of which are located off the coast of VIC and four off the coast of TAS (DoCCEEW, 2023). The largest established breeding colonies are found on Lady Julia Percy Island (approximately 45 km north of the OA) which supports c. 26% of the breeding population; and at Seal Rocks (201 km northeast of the OA) which supports 25% of the breeding population (Kirkwood *et al*., 2010).

Additional breeding colonies in the vicinity of the OA include Cape Bridgewater, approximately 32 km north of the OA, North Casuarina Island, South Australia, approximately 440 km northwest, and Reid Rocks, TAS, approximately 58 km east of the OA (Kirkwood *et al*., 2010). Individual Australian fur seals may migrate north over winter, returning to Bass Strait breeding colonies in late spring (Shaughnessy *et al*., 2001); however, breeding colonies are occupied year-round. The Australian fur seal has a single annual pupping period in the austral summer from late October to late December (DoCCEEW, 2023), with 90% of pups born in a 3 – 4-week period with a peak in early December (Gibbens and Arnould, 2009). Following the birth of their pups, females' alternate periods feeding at sea with periods at shore to suckle their pups. Pups begin to forage in June and July, with the majority fully weaned by September – October (Shaughnessy, 1999).



Source: Kirkwood et al. (2010)

Figure 38 Distribution of Australian Fur Seals

Australian fur seals are predominantly benthic foragers on the shallow (< 100 m) continental shelf of Bass Strait, feeding on a wide variety of prey types comprising bony fish, elasmobranchs, and cephalopods (Speakman *et al*., 2020). Fish species of note in the diet of this species are redbait, leatherjacket, and jack mackerel, with seabirds also opportunistically taken (Warneke and Shaughnessy, 1985). Fish comprise the majority of the diet in winter, with cephalopods dominating in summer (Shaughnessy, 1999). Foraging may occur up to 500 km from a colony (Littnan and Arnould, 2002) and appears to peak in autumn and winter (Lyle and Willcox, 2008), when males and females are building up their energy reserves for the pupping season and females are maintaining milk reserves for their young. Lactating females were found to forage exclusively within the shallow waters over the continental shelf of Bass Strait, where water depths are around 60-80 m and sea surface temperature is 16- 16.8 °C (Arnould and Kirkwood, 2008).

Given the close proximity of the OA to breeding colonies, and the extensive foraging range of this species, Australian fur seals are likely to be encountered during the Otway Basin 3D MC MSS. The likelihood of encounter during the Otway Basin 3DMC MSS has been assessed as '**moderate**'.

4.5.6.3.3 New Zealand fur seal

New Zealand fur seals (*Arctocephalus forsteri)* (also known as the long-nosed fur seal) occur in both New Zealand and Australian waters with population numbers in Australia now estimated at around 117,400 (Chilvers and Goldsworthy, 2015). In Australia, this non-migratory species breeds at locations ranging from NSW to Western Australia (Shaughnessy *et al.,* 2015). This species was subject to commercial hunting in the late 18th and early 19th century but are currently listed as Least Concern under the IUCN Red List, and they are not listed under the EPBC Act 1999.

Most of the Australian population is located in South Australia, between Kangaroo Island and the southern tip of the Eyre Peninsula, with a single small breeding site at Baudin Rocks, located approximately 170 km northwest of the OA (Shaughnessy *et al*., 2015). The highest number of breeding sites (n=12) are found on Kangaroo Island (390 km northwest of the OA), accounting for 49.6% of the total pup abundance estimate for South Australia (Shaughnessy *et al*., 2015). Breeding sites in VIC include Cape Bridgewater, approximately 32 km north of the OA, Kanowna Island, and the Skerries, located approximately 273 km northeast and 590 km northeast of the OA, respectively (Kirkwood *et al*., 2009). Breeding takes place between October and January, with pups born from mid-November, and most born in December (Chilvers and Goldsworthy, 2015). Colonies are occupied year-round, with activity peaking during the summer breeding season (Shaughnessy, 1999). New Zealand fur seals are typically found along the coast on rocky parts of islands (Shaughnessy, 1999). Adult males begin defending coastal territories in late November, with onshore numbers peaking in early January (Goldsworthy and Shaughnessy, 1994). Adult females come to shore in early December and give birth soon after. Females continue to suckle their pups for several months, alternating between periods at sea and onshore feeding of pups (Shaughnessy, 1999).

Satellite tracking studies in South Australia found adult females forage in mid-outer shelf waters in regions associated with localised upwelling (Bonney Upwelling) approximately 70 – 90 km from breeding colonies in December to March, switching to foraging in distant oceanic waters associated with the sub-tropical front, approximately 700 - 1,000 km south of breeding colonies between April/May to September/October (Baylis *et al*., 2008). Satellite tracking studies of juveniles from Kangaroo Island showed that they typically forage in pelagic waters ~1,000 km further south in association with the sub-tropical front (Shaughnessy and Goldsworthy, 2020). Male New Zealand fur seals typically forage in deeper waters than females (Goldsworthy and Page, 2009). New Zealand fur seals mainly dive at depths between 10 to 70 m, but adult females are capable of maximum depths ranging from 106 to 225 m (Harcourt *et al.,* 1995; Harcourt and Davis, 1997).

The OA is spatially proximate to aggregation/breeding areas of New Zealand fur seals and the Bonney Upwelling, a recognised foraging area for New Zealand fur seals during the summer months. Therefore, the likelihood of New Zealand fur seals being encountered during the Otway Basin 3D MC MSS has been assessed as '**moderate**'.

4.5.7 Seabirds and Migratory Shorebirds

Over 100 species of seabird occur naturally or regularly visit Australia during their lifecycle. Coastal and oceanic habitats, particularly offshore islands and surrounding waters are critically important areas for seabirds during both the breeding and non-breeding seasons as places to breed, rest, and feed. For long-distance migratory species, these habitats also provide resources so birds can build enough energy reserves to complete their annual migration.

Several seabirds have been identified as potentially present within the OA and/or EMBA based on the EPBC Act Protected Matters Report (**Appendix D**). A list of the seabird species identified within the EPBC Act Protected Matters Report are provided in **Table 30**, with further descriptions on distribution, migration movements, preferred habitat and life stages of the threatened species provided in **Appendix F**.

The offshore distribution of seabirds is patchy, with birds congregating in areas where food is abundant (Reid *et al*., 2002). Several the seabirds identified as potentially present do not breed near the OA, as there are no islands within the OA to support breeding colonies, and seabirds breeding season will also determine the presence of seabirds. Therefore, not all the species identified in **Table 30** may be present during the Otway Basin 3D MC MSS.

Several seabird BIAs have been identified as relevant to the Otway Basin 3D MC MSS, based on the results contained within the EPBC Act Protected Matters Report. These BIAs are depicted in **Figure 39** – **Figure 44** and listed in **Table 31**.

Of the BIAs listed in **Table 31**, many have been identified as important areas for breeding. All areas identified as important breeding areas for seabirds are located inshore of the OA.

Table 30 Seabirds Identified as Present within the OA/EMBA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
Red knot (*Calidris canutus*)	Endangered	Species or species habitat MAY occur in OA Species or species habitat KNOWN to occur within EMBA overfly marine area	No BIA
Curlew sandpiper (*Calidris ferruginea*)	Critically endangered	Species or species habitat MAY occur in OA	No BIA
Antipodean albatross (*Diomedea antipodensis*)	Vulnerable	KNOWN to occur in OA and EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in OA and EMBA
Southern royal albatross (*Diomedea epomophora*)	Vulnerable	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in OA
Wandering albatross (*Diomedea exulans*)	Vulnerable	KNOWN to occur in OA LIKELY to occur in EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in EMBA
Northern royal albatross (*Diomedea sanfordi*)	Endangered	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	No BIA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
White-bellied storm-petrel (*Fregetta grallaria grallaria*)	Vulnerable	Species or species habitat LIKELY to occur within OA and EMBA	No BIA
Blue petrel (*Halobaena caerulea*)	Vulnerable	Species or species habitat MAY occur in OA and EMBA	No BIA
Southern giant petrel (*Macronectes giganteus*)	Endangered	KNOWN to occur in EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in EMBA
Northern giant petrel (*Macronectes halli*)	Vulnerable	KNOWN to occur in EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in EMBA
Eastern curlew (*Numenius madagascariensis*)	Critically endangered	Species or species habitat MAY occur in OA Species or species habitat KNOWN to occur in EMBA	No BIA
Fairy prion (*Pachyptila turtur subantarctica*)	Vulnerable	Species or species habitat MAY occur in OA Species of species habitat KNOWN to occur in EMBA	No BIA
Sooty albatross (*Phoebetria fusca*)	Vulnerable	Species or species habitat LIKELY to occur within OA and EMBA	No BIA
Gould's petrel (*Pterodroma leucoptera leucoptera*)	Endangered	Species or species habitat MAY occur in OA and EMBA	No BIA
Soft-plumaged petrel (*Pterodroma mollis*)	Vulnerable	Species or species habitat MAY occur in OA Breeding KNOWN to occur in EMBA	Foraging and breeding BIAs in EMBA
Australian fairy tern (*Sternula nereis nereis*)	Vulnerable	Species or species habitat LIKELY to occur within OA Species or species habitat KNOWN to occur in EMBA	No BIA
Buller's albatross (*Thalassarche bulleri*)	Vulnerable	KNOWN to occur in OA and EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in OA and EMBA
Northern Buller's albatross (*Thalassarche bulleri platei*)	Vulnerable	Species or species habitat LIKELY to occur within OA Foraging, feeding or related behaviour LIKELY to occur within EMBA	No BIA
Indian yellow-nosed albatross (*Thalassarche carteri*)	Vulnerable	KNOWN to occur in OA and EMBA Species or species habitat LIKELY to occur within OA and EMBA	Foraging BIA in OA and EMBA
Shy albatross (*Thalassarche cauta*)	Endangered	LIKELY to occur in OA Foraging, feeding or related behaviour LIKELY to occur within OA Breeding KNOWN to occur within EMBA	Foraging BIA in OA Foraging likely and breeding BIAs in EMBA
Grey-headed albatross (*Thalassarche chrysostoma*)	Endangered	Species or species habitat MAY occur in OA Foraging, feeding or related behaviour LIKELY to occur within EMBA	No BIA
Campbell albatross (*Thalassarche impavida*)	Vulnerable	KNOWN to occur in OA and EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in OA and EMBA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
Black-browed albatross (*Thalassarche melanophris*)	Vulnerable	KNOWN to occur in OA and EMBA Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	Foraging BIA in OA and EMBA
Salvin's albatross (*Thalassarche salvini*)	Vulnerable	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA	No BIA
White-capped albatross (*Thalassarche steadi*)	Vulnerable	Foraging, feeding or related behaviour KNOWN to occur within OA and EMBA	Foraging BIA in EMBA
Flesh-footed shearwater (*Ardenna carneipes*)	No threat listing	KNOWN to occur in EMBA Foraging, feeding or related behaviour LIKELY to occur within OA Species or species habitat KNOWN to occur in EMBA	Foraging BIA in EMBA
Sooty shearwater (*Ardenna grisea*)	No threat listing	KNOWN to occur in EMBA Species or species habitat MAY occur in OA Breeding KNOWN to occur in EMBA	Breeding and foraging BIAs in EMBA
Wedge-tailed shearwater (*Ardenna pacifica*)	No threat listing	LIKELY to occur in OA KNOWN to occur in EMBA	Foraging BIA in OA Foraging and breeding BIAs in EMBA
Short-tailed shearwater (*Ardenna tenirostris*)	No threat listing	KNOWN to occur in OA and EMBA Breeding KNOWN to occur in EMBA	Foraging BIA in OA Foraging and breeding BIAs in EMBA
Australasian gannet (*Morus serrator*)	No threat listing	KNOWN to occur in OA and EMBA Breeding KNOWN to occur within EMBA	Foraging BIA in OA Aggregation and foraging BIAs in EMBA
White-faced storm petrel (*Pelagodroma marina*)	No threat listing	KNOWN to occur in OA and EMBA Breeding KNOWN to occur in EMBA	Foraging BIA in OA Foraging and breeding BIAs in EMBA
Common diving-petrel (*Pelecanoides urinatrix*)	No threat listing	KNOWN to occur in OA and EMBA Breeding KNOWN to occur in EMBA	Foraging BIA in OA Foraging and breeding BIA in EMBA
Tasmanian wedge-tailed eagle (*Aquila audax fleayi*)	Endangered	Breeding LIKELY to occur in EMBA	No BIA
Gibson's albatross (*Diomedea antipodensis gibsoni*)	Vulnerable	Foraging, feeding or related behaviour LIKELY to occur within EMBA	No BIA
Chatham albatross (*Thalassarche eremita*)	Endangered	Foraging, feeding or related behaviour MAY to occur within EMBA	No BIA
Caspian tern (*Hydroprogne caspia*)	No threat listing	Breeding KNOWN to occur within EMBA	No BIA
White-tailed tropicbird (*Phaethon lepturus*)	No threat listing	Species or species habitat MAY occur within EMBA	No BIA
Little tern (*Sternula albifrons*)	No threat listing	Breeding KNOWN to occur within EMBA	No BIA
Magpie goose (*Anseranas semipalmata*)	No threat listing	Species or species habitat MAY occur within EMBA overfly marine area	No BIA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
Fork-tailed swift (*Apus pacificus*)	No threat listing	Species or species habitat LIKELY occur within EMBA overfly marine area	No BIA
Cattle egret (*Ardea ibis*)	No threat listing	Species or species habitat MAY occur within EMBA overfly marine area	No BIA
Curlew sandpiper (*Calidris ferruginea*)	Critically endangered	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Pectoral sandpiper (*Calidris melanotos*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Red-necked stint (*Calidris ruficollis*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Great knot (*Calidris tenuirostris*)	Critically endangered	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Black-eared cuckoo (*Chrysococcyx osculans*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Double-banded plover (*Charadrius bicinctus*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Red-capped plover (*Charadrius ruficapillus*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Latham's snipe (*Gallinago hardwickii*)	No threat listing	Species or species habitat KNOWN to occur within EMBA overfly marine area	No BIA
Swinhoe's snipe (*Gallinago megala*)	No threat listing	Roosting LIKELY to occur within EMBA overfly marine area	No BIA
Pin-tailed snipe (*Gallinago stenura*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Pied stilt (*Himantopus Himantopus*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
White-throated needletail (*Hirundapus caudacutus*)	Vulnerable	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Kelp gull (*Larus dominicanus*)	No threat listing	Breeding KNOWN to occur within EMBA	No BIA
Pacific gull (*Larus pacificus*)	No threat listing	Breeding KNOWN to occur within EMBA	No BIA
Swift parrot (*Lathamus discolor*)	Critically endangered	Breeding KNOWN to occur within EMBA overfly marine area	No BIA
Broad-billed sandpiper (*Limicola falcinellus*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Black-tailed godwit (*Limosa limosa*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Rainbow bee-eater (*Merops ornatus*)	No threat listing	Species or species habitat MAY occur within EMBA overfly marine area	No BIA
Black-faced monarch (*Monarcha melanopsis*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
Cape gannet (*Morus capensis*)	No threat listing	Breeding KNOWN to occur within EMBA	No BIA
Yellow wagtail (*Motacilla flava*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Satin flycatcher (*Myiagra cyanoleuca*)	No threat listing	Breeding KNOWN to occur within EMBA overfly marine area	No BIA
Orange-bellied parrot (*Neophema chrysogaster*)	Critically endangered	Breeding KNOWN to occur within EMBA overfly marine area	No BIA
Blue-winged parrot (*Neophema chrysostoma*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Litter curlew (*Numernius minutus*)	No threat listing	Roosting LIKELY to occur within EMBA overfly marine area	No BIA
Ruff (*Philomachus pugnax*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Grey plover (*Pluvialis squatarola*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Great-winged petrel (*Pterodroma macroptera*)	No threat listing	LIKELY to occur in EMBA Foraging, feeding or related behaviour KNOWN to occur within EMBA	Foraging BIA in EMBA
Red-necked avocet (*Recurvirostra novaehollandiae*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Rufous fantail (*Rhipidura rufifrons*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Australian painted snipe (*Rostrutula benghalensis*)	Endangered	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Great skua (*Catharacta skua*)	No threat listing	Species or species habitat MAY occur within EMBA	No BIA
Australian pratincole (*Stiltia Isabella*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Spectacled monarch (*Monarcha trivirgatus*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Hooded plover (*Thinornis rubricollis*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Wood sandpiper (*Tringa glareola*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Common greenshank (*Tringa nebularia*)	No threat listing	Species or species habitat KNOWN occur within EMBA overfly marine area	No BIA
Marsh sandpiper (*Tringa stagnatilis*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Terek sandpiper (*Xenus cinereus*)	No threat listing	Roosting KNOWN to occur within EMBA overfly marine area	No BIA
Little penguin	No threat listing	KNOWN to occur in EMBA	Foraging and breeding BIAs in EMBA

Name	Threat Category	Presence in OA and/or EMBA	Location of BIA
Wilson's storm petrel (*Oceanites oceanites*)	No threat listing	KNOWN to occur in EMBA	Migration BIA in EMBA
Black-faced cormorant (*Phalacrocorax fuscescens*)	No threat listing	KNOWN to occur in EMBA	Foraging and breeding BIAs in EMBA
Black petrel (*Procellaria parkinsoni*)	No threat listing	LIKELY to occur in EMBA	Foraging BIA in EMBA
White-fronted tern (*Sterna striata*)	No threat listing	KNOWN to occur in EMBA	Foraging BIA in EMBA
Crested tern (*Thalasseus bergii*)	No threat listing	LIKELY to occur in EMBA	Foraging BIA in EMBA

Note: this table only includes those species that are classed as seabirds (i.e. spend the majority of their lifecycle over marine waters) or which have been identified as present based on their presence within the EMBA overfly marine area.

Table 31 Seabird BIAs of Relevance to the OA and EMBA

Species	BIA type	Relevance to OA	Relevance to EMBA
Wedge-tailed shearwater	Foraging (x2)	Overlap	Overlap
	Breeding	65 km N of OA	Overlap
Short-tailed shearwater	Foraging (x3)	Overlap	Overlap
	Breeding (x89)	40 km E of OA	Overlap
Wandering albatross	Foraging (x2)	Overlap	Overlap
Antipodean albatross	Foraging (x2)	Overlap	Overlap
Australasian gannet	Foraging (x4)	Overlap	Overlap
	Aggregation (x7)	39 km N of OA	Overlap
White-faced storm-petrel	Foraging (x3)	Overlap	Overlap
	Breeding (x12)	99 km E of OA	Overlap
Common diving-petrel	Foraging	Overlap	Overlap
	Breeding (x16)	45 km N of OA	Overlap
Bullers albatross	Foraging	Overlap	Overlap
Shy albatross	Foraging	Overlap	Overlap
	Breeding	89 km E of OA	Overlap
Indian yellow-nosed albatross	Foraging (x2)	Overlap	Overlap
	Foraging likely	495 km SE of OA	Overlap
Black-browed albatross	Foraging (x2)	Overlap	Overlap
Campbell albatross	Foraging (x2)	Overlap	Overlap
Flesh-footed shearwater	Foraging	713 km NE of OA	Overlap
Sooty shearwater	Foraging (x3)	240 km SE of OA	Overlap
	Breeding (x2)	342 km SE of OA	Overlap
Little penguin	Foraging (x17)	44 km E of OA	Overlap
	Breeding (x39)	50 km E of OA	Overlap

Species	BIA type	Relevance to OA	Relevance to EMBA
Southern giant petrel	Foraging	716 km NE of OA	Overlap
Northern giant petrel	Foraging	716 km NE of OA	Overlap
Wilson's storm petrel	Migration	716 km NE of OA	Overlap
Black-faced cormorant	Foraging (x10)	44 km E of OA	Overlap
	Breeding (x16)	50 km E of OA	Overlap
Black petrel	Foraging	716 km NE of OA	Overlap
Great-winged petrel	Foraging	716 km NE of OA	Overlap
Soft-plumaged petrel	Foraging	80 km SE of OA	Overlap
	Breeding	342 km SE of OA	Overlap
White-fronted tern	Foraging	368 km E of OA	Overlap
White-capped albatross	Foraging	716 km NE of OA	Overlap
Crested tern	Foraging	697 km NE of OA	Overlap

Note: Where several BIAs exist for each species and for the same BIA type, the distance provided represents the closest BIA of that type to the OA.

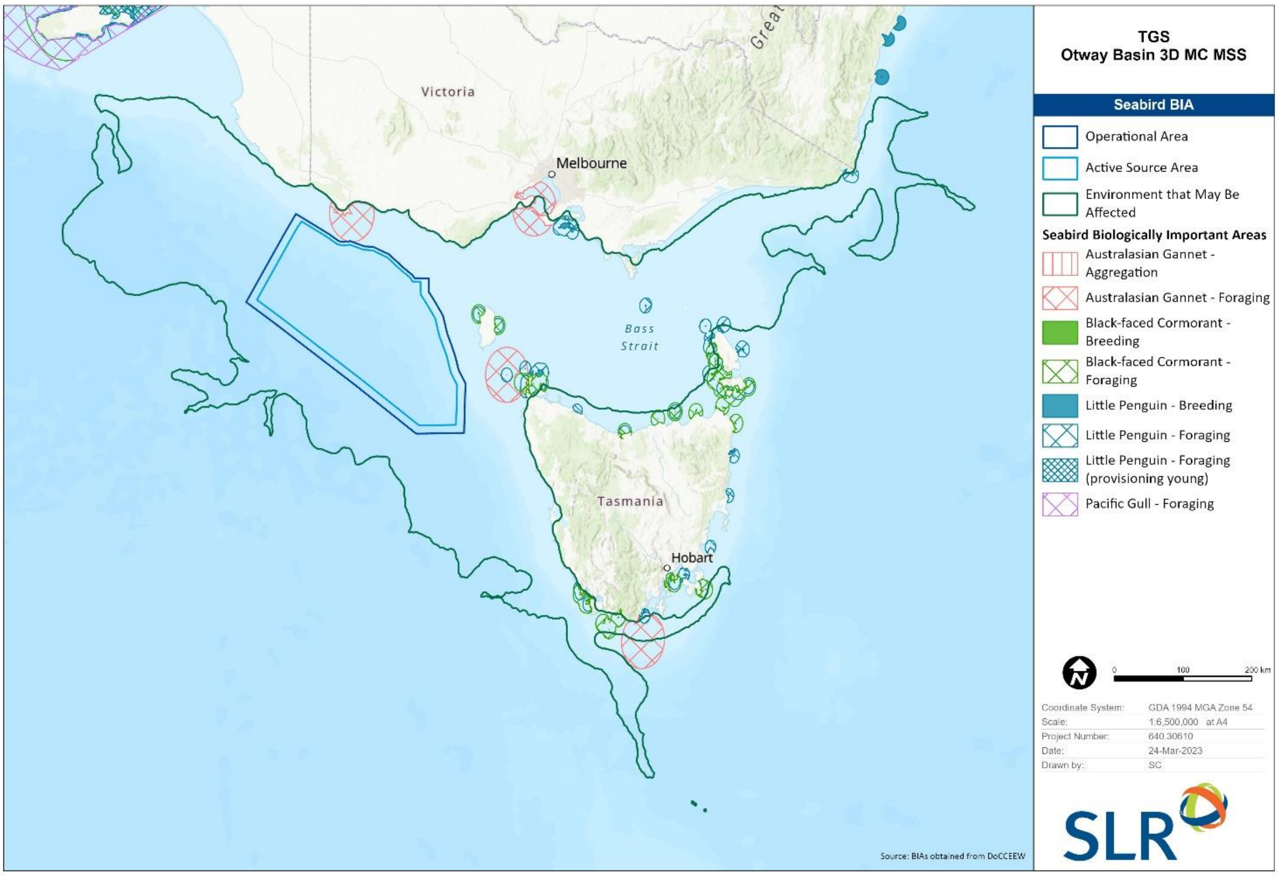


Figure 39 Australasian Gannet, Black-faced Cormorant, Little Penguin and Pacific Gull BIAs of Relevance to the OA and EMBA

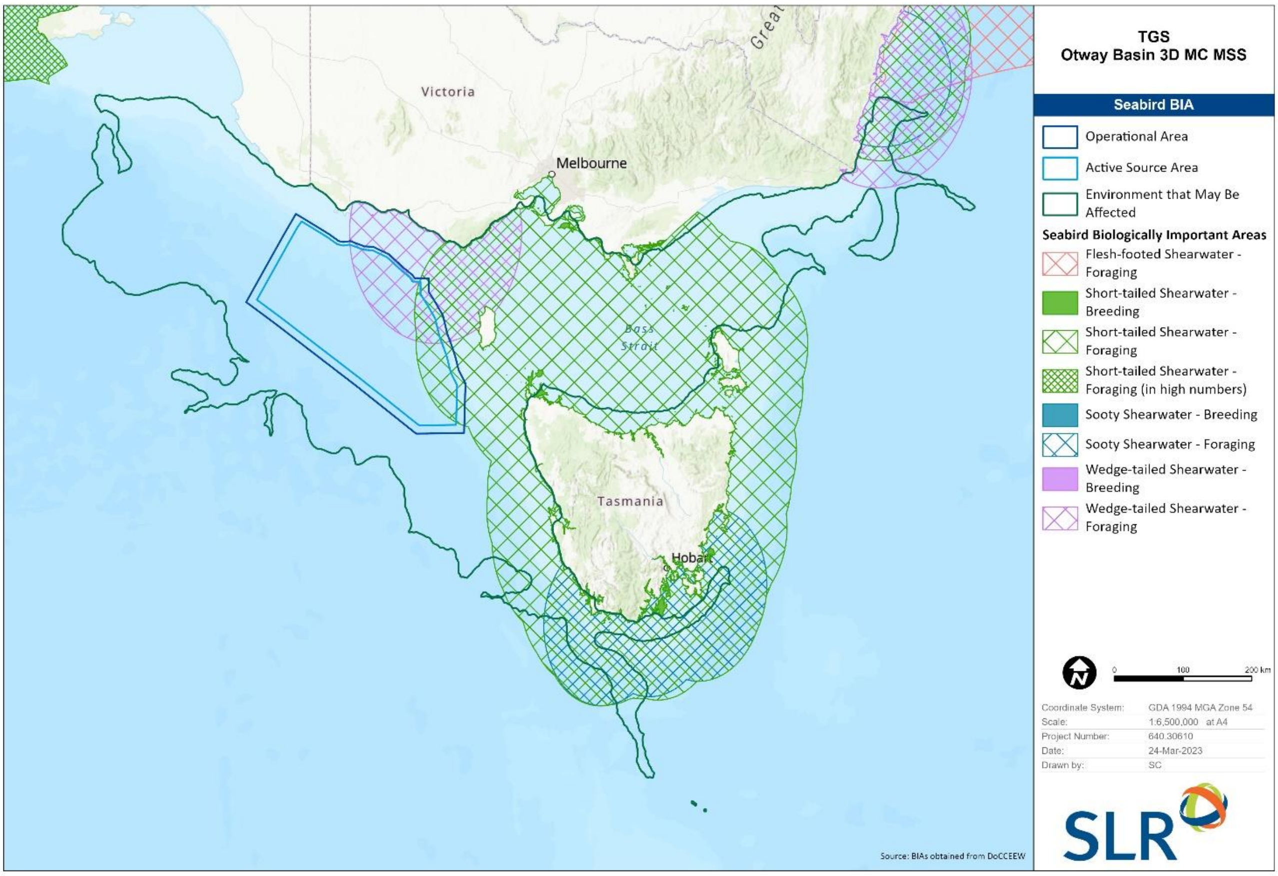


Figure 40 Flesh-footed Shearwater, Short-tailed Shearwater, Sooty Shearwater, and Wedge-tailed Shearwater BIAs of Relevance to the OA and EMBA

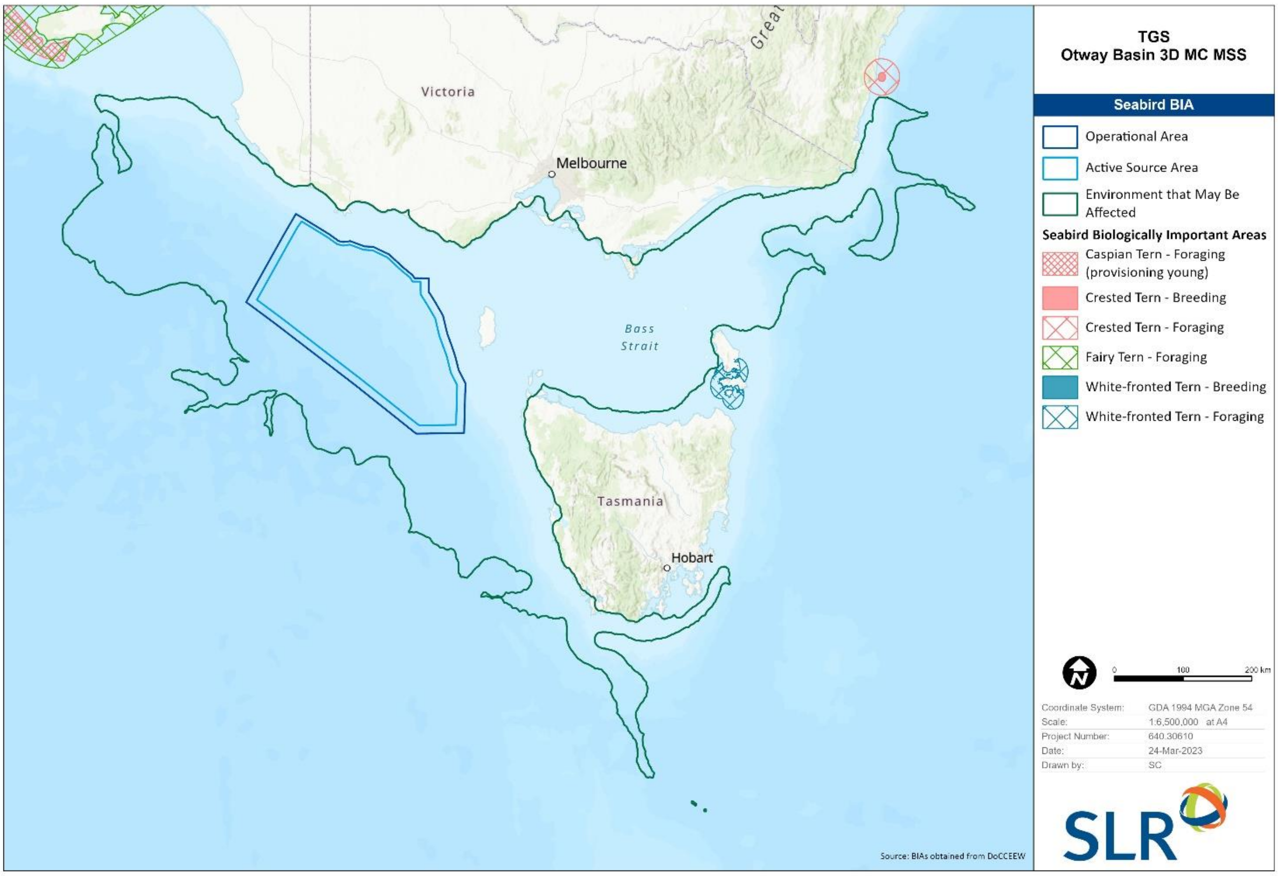


Figure 41 Caspian Tern, Crested Tern, Fairy Tern, and White-fronted Tern BIAs of Relevance to the OA and EMBA

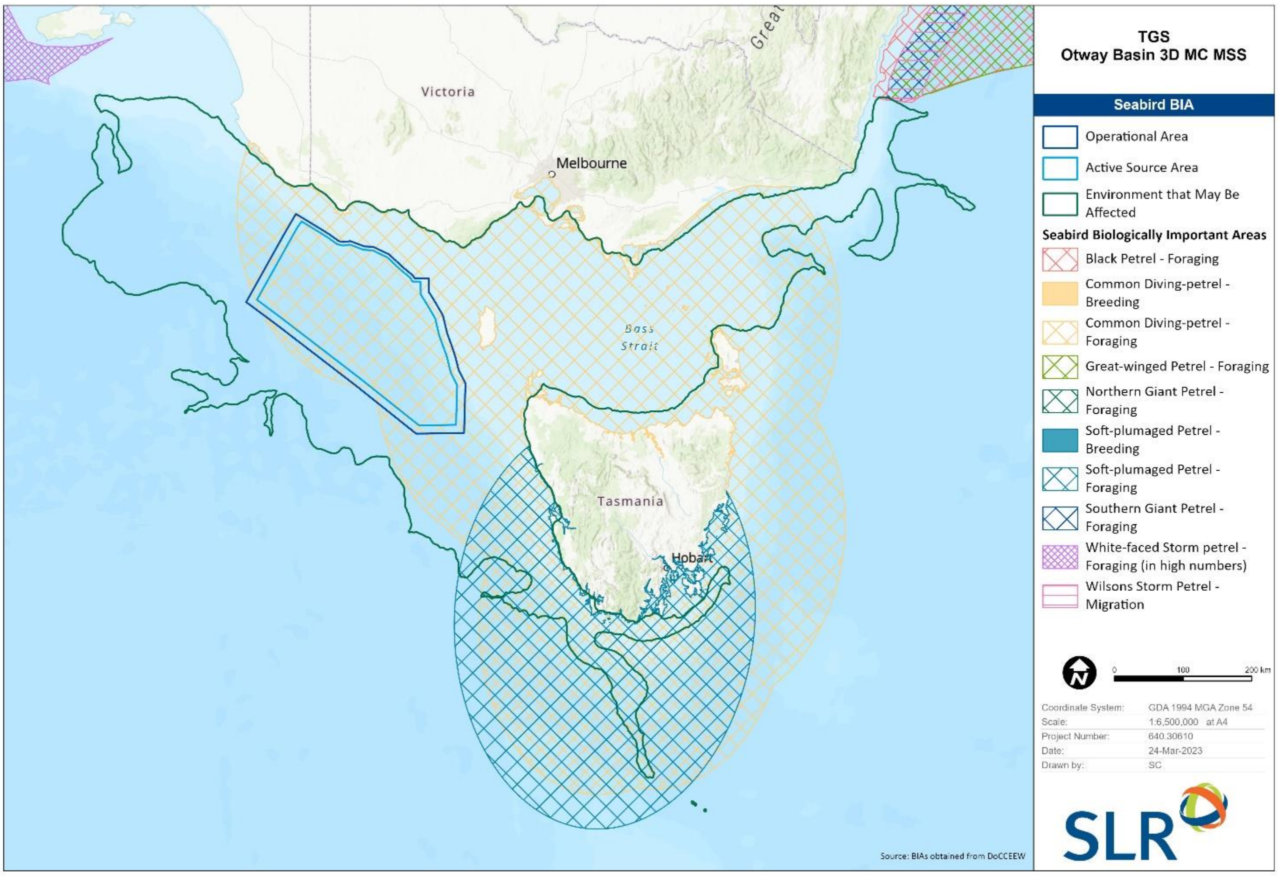


Figure 42 Black Petrel, Common Diving-petrel, Great-winged Petrel, Northern Giant Petrel, Soft-plumaged Petrel, Southern Giant Petrel, White-faced Storm Petrel, and Wilsons Storm Petrel BIAs of Relevance to the OA and EMBA

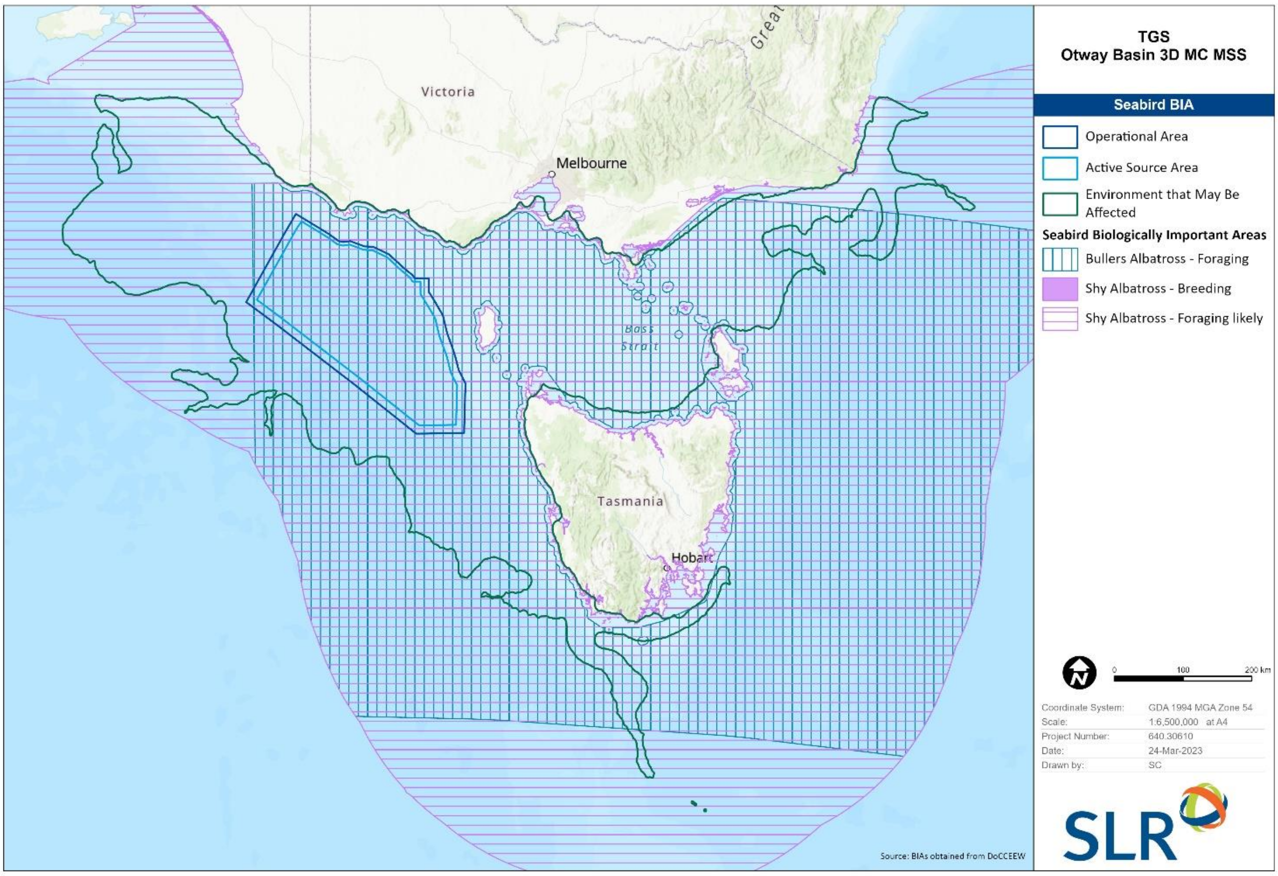


Figure 43 Bullers Albatross and Shy Albatross BIAs of Relevance to the OA and EMBA

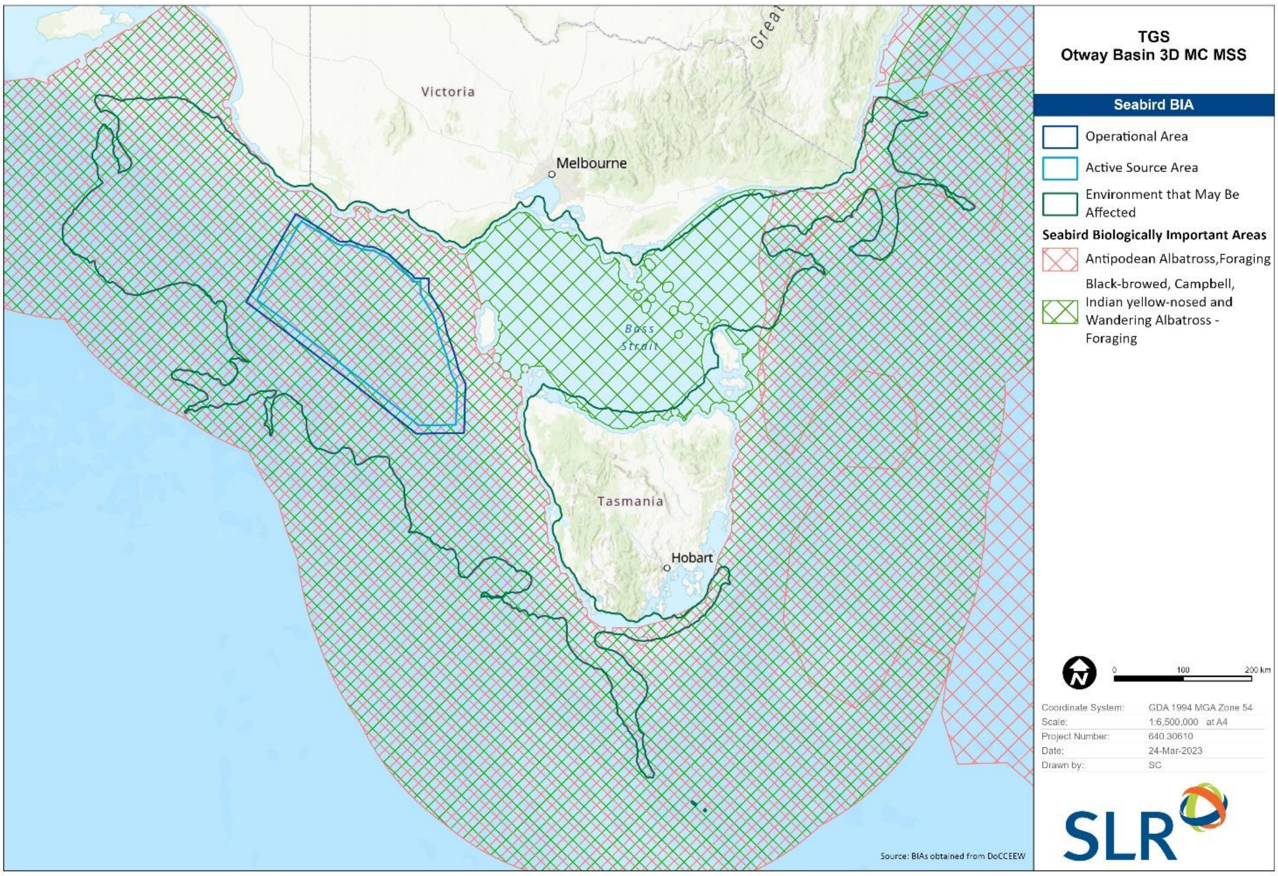


Figure 44 Antipodean Albatross, Black-browed Albatross, Campbell Albatross, Indian Yellow-nosed Albatross, and Wandering Albatross BIAs of Relevance to the OA and EMBA

4.5.8 Conservation Management Plans

Species Recovery Plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened ecological communities. Recovery plans are enacted under the EPBC Act and remain in force until the species is removed from the threatened list. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species or ecological community.

Based on the characterisation of the biological environment provided in **Section 4.5**, a summary of the EPBC Act Conservation Management Plans, Recovery Plans and Conservation Advice that relate to species with the potential to occur within the OA are described in **Table 32**. In addition, any relevant measure contained within the conservation advice and recovery plans has been considered as part of the assessment of impacts and risks that may occur as a result of the Seismic Survey (**Section 7** – **Section 9**). The Otway Basin 3D MC MSS will be conducted in a manner consistent with conservation advice and recovery plans for species with the potential to be present in the OA.

Table 32 EPBC Act Conservation Management Plans, Recovery Plans and Conservation Advice relevant to the Otway Basin 3D MC MSS

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Bony fish and elasmobranchs			
White shark	Recovery plan for the White Shark (*Carcharodon carcharias*)	Ecosystem effects as a result of habitat modification and climate change	Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Spotted Handfish	Approved conservation advice for *Brachionichthys hirsutus* (Spotted Handfish) Recovery Plan for Three Handfish Species	Habitat degradation (pollution)	Ensure there is no disturbance in areas where spotted handfish occur. Manage any changes to hydrology that may result in increased sedimentation or pollution.
Ziebella Handfish	Recovery Plan for Three Handfish Species	Habitat degradation (pollution)	Ensure there is no disturbance in areas where spotted handfish occur. Manage any changes to hydrology that may result in increased sedimentation or pollution
Red Handfish	Approved conservation advice for *Thymichthys politus* (Red Handfish) Recovery Plan for Three Handfish Species	Habitat degradation (pollution)	Ensure there is no disturbance in areas where spotted handfish occur. Prevent changes to hydrology that may result in increased sedimentation or pollution.
Black Rockcod	Approved conservation advice for *Epinephelus daemelli* (black cod)	No relevant threats listed	N/A.
Australian Grayling	Conservation advice *Protroctes maraena* (Australian Grayling). National recovery plan for Australian Grayling (*Prototroctes maraena*)	Habitat loss and fragmentation Altered hydrology Poor water quality	Protect key habitat areas used by Australian Grayling.
Eastern Gemfish	Commonwealth listing advice on *Rexa solandri*	No relevant threats listed	N/A.
Grey Nurse Shark	Recovery plan for the Grey Nurse Shark (*Carcharias taurus*)	Habitat modification and pollution	Ensure protection at key aggregation sites and BIAs.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Whale Shark	Conservation Advice *Rhincodon typus*, whale shark	Habitat disruption from mineral exploration	Minimise offshore developments.
Maugean Skate	Approved Conservation advice for *Raja* sp.L (Maugen Skate)	Habitat loss, disturbance and modification	Manage any changes to hydrology that may result in pollution.
Marine invertebrates			
Tasmanian Live-bearing Seastar	Approved conservation advice for *Patiriella vivipara* (Tasmanian live-bearing seastar)	Habitat degradation and modification through pollution	Ensure infrastructure or development activities do not adversely impact on known populations.
Marine mammals			
Sei whale	Approved Conservation Advice for *Balaenoptera borealis* (sei whale)	Pollution (persistent toxic pollutants)	Implement measures to manage and reduce, where possible, waste generation.
		Vessel strike	Ensure all vessel strike incidents are reported in the National Vessel Strike Database.
		Anthropogenic noise and acoustic disturbance	All seismic surveys must be undertaken consistent with Part A of the EPBC Act Policy Statement 2.1.
		Habitat degradation including pollution (increasing port expansion and coastal development)	Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Blue whale	Blue Whale Conservation Management Plan 2015 - 2025	Noise interference	Anthropogenic noise in BIAs will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area. EPBC Act Policy Statement 2.1 is applied to all seismic surveys.
		Habitat modification	Implement measures to reduce adverse impacts of habitat degradation and/or modification.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
		Vessel disturbance	Ensure all vessel strike incidents are reported in the National Ship Strike Database. Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, implement appropriate mitigation measures.
Southern right whale	Conservation Management Plan for the Southern Right Whale 2011-2021	Noise interference	Minimise the risk of acoustic injury to whales in the vicinity of seismic survey operations. Minimise the risk of biological consequences from acoustic disturbance from seismic survey sources to whales in biologically important habitat areas or during critical behaviours. All seismic surveys must be undertaken consistent with Part A of the EPBC Act Policy Statement 2.1.
		Vessel disturbance	Implement measures to reduce and, where possible, eliminate chronic disturbance leading to increased energetic costs or disruption of critical social behaviours to individual whales as a result of avoidance of vessels. Ensure all vessel strike incidents are reported in the National Vessel Strike Database.
		Entanglement (marine debris)	Reduce and, where possible, eliminate any adverse impacts of marine debris.
		Habitat modification	Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (fin whale)	Pollution (persistent toxic pollutants)	Implement measures to manage and reduce, where possible waste generation. Reduce and, where possible, eliminate any adverse impacts of marine debris.
		Vessel strike	Ensure all vessel strike incidents are reported in the National Vessel Strike Database.
		Anthropogenic noise and acoustic disturbance	All seismic surveys must be undertaken consistent with Part A of the EPBC Act Policy Statement 2.1.
		Habitat degradation	Implement measures to reduce adverse impacts of habitat degradation and/or modification.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Southern Elephant Seal	Conservation advice for the southern elephant seal (*Mirounga leoina)*	Pollution	Adapt management actions to reduce disturbance and pollution impacts of southern elephant seals and their important breeding, foraging and resting habitats.
Australian sea lion	Recovery Plan for the Australian sea lion (*Neophoca cinerea*) Issues paper for the Australian sea lion (*Neophoca cinerea*) Conservation Advice *Neophoca cinerea* (Australian sea lion)	Entanglement (marine debris) / ingestion of plastic	Reduce and, where possible, eliminate any adverse impacts of marine debris.
		Habitat degradation / marine pollution (Inc. fuel oil spills)	Implement measures to reduce adverse impacts of habitat degradation and/or modification. Implement measures to manage and reduce, where possible, waste generation.
		Noise interference	Minimise the risk of acoustic injury to sea lions in the vicinity of seismic survey operations.
Marine reptiles			
Loggerhead Turtle	Recovery plan for marine turtles in Australia 2017 – 2027	Deteriorating water quality	Implement measures to manage and reduce, where possible waste generation.
Green Turtle		Marine debris	Reduce and, where possible, eliminate any adverse impacts of marine debris on marine turtles.
Leatherback Turtle		Light pollution	Manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and emerging/dispersing hatchlings can continue.
Flatback turtle		Vessel disturbance	Manage activities to ensure marine turtles are not displaced from identified Habitat Critical to the survival and BIAs.
Hawksbill Turtle		Noise interference	A precautionary approach should be applied to seismic work, such that surveys planned to occur inside important internesting habitat should be scheduled outside the nesting season. Seismic surveys must undertake soft starts during surveys irrespective of location and time of year to protect marine turtles.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Seabirds and migratory shorebirds			
Orange-bellied Parrot	National Recovery Plan for the orange-bellied parrot	Barriers to migration and movement (light disturbance)	Manage artificial light from onshore and offshore sources to ensure biologically important migratory behaviours can continue.
Red Knot	Approved Conservation Advice for *Calidris canutus* (Red knot)	Pollution/contamination impacts	Implement measures to manage and reduce, where possible, waste generation.
		Disturbance	Manage disturbance at important sites when red knots are present.
		Habitat loss and degradation	Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Curlew Sandpiper	Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper)	Habitat loss and degradation from pollution	Manage disturbance at important sites when curlew sandpipers are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Eastern Curlew	Approved Conservation Advice for *Numenius madagascariensis* (Eastern Curlew)	Habitat loss and degradation from pollution	Manage disturbance at important sites when eastern curlews are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Australian Fairy Tern	Approved Conservation Advice for *Sternula nereis* (Australian fairy tern) National Recovery Plan for the Australian Fairy Tern (*Sternula nereis*)	Habitat loss, disturbance and modification from pollution	Manage disturbance at important sites when Australian fairy terns are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Flesh-footed Shearwater	Conservation Advice *Ardenna carneipes* (flesh-footed shearwater)	Habitat loss, disturbance and modification	Manage disturbance at important sites when eastern curlews are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
		Marine pollution (plastics)	Reduce and, where possible, eliminate any adverse impacts of marine debris on flesh-footed shearwaters.
Shy Albatross	Draft National Recovery Plan for Threatened Albatrosses and Giant Petrels 2021 (CoA 2021a) Conservation Advice *Thalassarche cauta* (shy albatross)	Marine pollution (plastics)	Reduce and, where possible, eliminate any adverse impacts of marine debris on albatrosses.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Grey-headed Albatross	Draft National Recovery Plan for Threatened Albatrosses and Giant Petrels 2021 Approved Conservation Advice for *Thalassarche chrysostoma* (grey-headed albatross)	Marine pollution	Reduce and, where possible, eliminate any adverse impacts of marine debris on albatrosses.
Wandering Albatross Antipodean Albatross Southern Royal Albatross Northern Royal Albatross Sooty Albatross Buller's Albatross Northern Buller's Albatross Black-browed Albatross Campbell Albatross Chatham Albatross Gibson's Albatross Indian Yellow-nosed Albatross Salvin's Albatross Southern Giant Petrel Northern Giant Petrel White-capped Albatross	Draft National Recovery Plan for Threatened Albatrosses and Giant Petrels 2021	Marine pollution	Reduce and, where possible, eliminate any adverse impacts of marine debris on albatrosses.

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Soft-plumaged Petrel	Conservation Advice *Pterodroma mollis* (soft-plumaged petrel)	Habitat loss, disturbance and modification from pollution	Manage disturbance at important sites when soft-plumaged petrels are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
		Marine pollution	Reduce and, where possible, eliminate any adverse impacts of marine debris on petrels.
White-bellied Storm Petrel	Lorde Howe Island Biodiversity Management Plan	Entanglement in or ingestion of anthropogenic debris	Protect habitat of the White-bellied Storm Petrel
Blue Petrel	Conservation Advice *Halobaena caerulea* (blue petrel)	Habitat loss, disturbance and modification from pollution	Manage disturbance at important sites when blue petrels are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Gould's Petrel	Goulds Petrel (*Pterodroma leucoptera leucoptera*) Recovery Plan	Oceanic oil spills	Manage threats operating at sites where the subspecies occurs.
Fairy Prion (southern)	Conservation Advice *Pachyptila turtur subantarctica* (fairy prion (southern))	Habitat loss, disturbance and modification from pollution	Manage disturbance at important sites when fairy prions (southern) are present. Implement measures to reduce adverse impacts of habitat degradation and/or modification.
Eastern Hooded Plover	Conservation Advice *Thinornis rubricollis rubricollis* (hooded plover (eastern))	Marine pollution and entanglement/ingestion of marine debris	Reduce and, where possible, eliminate any adverse impacts of marine debris on eastern hooded plovers.
Greater Sand Plover	Conservation Advice *Charadrius leschenaultii* Greater sand plover	Habitat loss and degradation Pollution/contamination	Managed disturbance a important sites which are subject to anthropogenic disturbance when greater sand plovers are present
Lesser Sand Plover	Conservation Advice *Charadrius mongolus* Lesser sand plover	Habitat loss and degradation Pollution/contamination	Managed disturbance at important sites which are subject to anthropogenic disturbance when lesser sand plovers are present
Nunivak Bar-tailed Godwit	Conservation Advice *Limosa lapponica baueri* Bar-tailed godwit (western Alaskan)	Habitat loss and degradation Pollution/contamination	Managed disturbance a important sites which are subject to anthropogenic disturbance when lesser sand plovers are present

Common Name	Recovery Plan / Conservation Advice	Threats identified as relevant to the Activity	Requirements relevant to the Otway Basin 3D MC MSS
Australian Painted Snipe	Approved Conservation Advice for *Rostratula australis* (Australian painted snipe)	Habitat loss, disturbance and modification	Manage any changes to hydrology that may result in pollution
Great Knot	Conservation Advice *Calidris tenuirostriss* Great knot	Habitat loss and degradation	Managed disturbance at important sites which are subject to anthropogenic disturbance when lesser great knots are present
		Pollution/contamination	
All migratory shorebirds	Wildlife conservation plan for migratory shorebirds	Anthropogenic disturbance (industrial operations and artificial lighting)	Investigate the significance of cumulative impacts on migratory shorebirds habitat and populations
		Habitat modification (Acute pollution)	Ensure all areas important to migratory shorebirds are considered in development assessment processes
All seabirds	Wildlife Conservation Plan for Seabirds 2022	Habitat modification and anthropogenic disturbance	Identify important habitats for all seabirds during critical life stages; and Manage anthropogenic disturbance to seabird breeding and roosting areas.
		Acute pollution (e.g. oil spills)	
		Light pollution	Enhance contingency plans to prevent and/or respond to environmental emergencies that have an impact on seabirds and their habitats.
		Invasive species	Ensure seabirds are protected from the adverse effects of invasive species.

4.6 Cultural and Heritage Values

Identifying features such as sites of Aboriginal significance and built European heritage is important to ensure cultural and heritage values are protected and preserved. Reliable information about the occurrence and extent of such features is limited or often not readily accessible. However, existing information and databases indicate they are predominantly terrestrial or constrained to the shoreline and coastal margins and fall within the State's jurisdiction.

The cultural and heritage properties of the OA and surrounding EMBA are considered below.

4.6.1 Aboriginal Heritage

Indigenous Australian people have a strong continuing connection with Land and Sea Country that extends back some 50,000 years. Across Australia, Indigenous people have been sustainably using and managing their Sea Country throughout this period. Sea Country is valued for Indigenous cultural identity, health and wellbeing. A preliminary search of the relevant state Aboriginal Heritage databases[4] was undertaken to assess the potential for Aboriginal sites or artefacts of significance to occur within the OA.

Sites of Aboriginal significance, and known sites of artefacts and archaeological significance, are largely constrained to the shoreline and near shore limits, within state coastal waters. The OA ranges from 35 km offshore from Portland to 57 km offshore from Otway, information currently displayed on the VIC Aboriginal Cultural Heritage Register and Information System (**ACHRIS**) public map indicates sites of are located across the shoreline, and do not extend offshore locations occupied by the OA. Similarly, the TAS Aboriginal Heritage Register indicates over 13,000 known places and objects of significance are listed on the register, and includes heritage sites of shell middens, stone artefacts, and possibly burial sites, rock shelters and stone arrangements (AHR, accessed May 2023). To this end, Aboriginal Heritage sites extend predominantly along the VIC coastline within the northern and north-eastern boundary of the EMBA, and along the western coastline of TAS, at the eastern extent of the EMBA. Given the EMBA reflects a coarse spatial footprint of impacts associated with an unplanned event (i.e. shoreline accumulation of hydrocarbons, in the event of a fuel oil spill), and the low likelihood of occurrence, these sites are not predicted to be impacted.

4.6.1.1 Native Title

Native Title is the recognition that Aboriginal and Torres Strait Islander people have rights and interests to land and waters according to their traditional law and customs. As set out in Australian Law, Native title is governed by the *Native Title Act 1993* (Cth). In accordance with the *Native Title Act 1993,* non-exclusive Native Title can exist offshore within the limits of Australia's territorial sea (12 NM), meaning that native titleholders will not have the right to exclude others from accessing the sea or seabed in the waters where native title exists.

A search of the National Native Title Tribunal Register[5] did not identify any Native Title areas or any pending titles within the OA.

[4] Aboriginal Culture and Heritage databases available at:
South Australia https://taawika.sa.gov.au/public/home
Victoria https://achris.vic.gov.au/#/onlinemap
New South Wales https://www.environment.nsw.gov.au/topics/heritage/search-heritage-databases/aboriginal-heritage-information-management-system
Tasmania https://www.aboriginalheritage.tas.gov.au/cultural-heritage
[5] National Native Title Register, accessed 26 March:
http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-National-Native-Title-Register.aspx

Native Title Determination Areas that are consented or under application, that intersect or are in close proximity to the boundary of the EMBA are listed in **Table 33**. Three Native Title Determination Consent Areas are registered at VIC coastline locations shown to include the extent of the coastline EMBA, two Native Title Determination areas were identified that are in close proximity to the nearshore coastal edge of the EMBA (South Australia and VIC), and four areas were identified that are currently subject to application processes (active cases), but were also identified as being in contact with the coastal edge of the EMBA or in close proximity to the offshore edge of the EMBA. Two areas in VIC (Boonwurrung People, Gunditjmara Area C) were assessed as Not Accepted for Registration and are not included in **Table 33**.

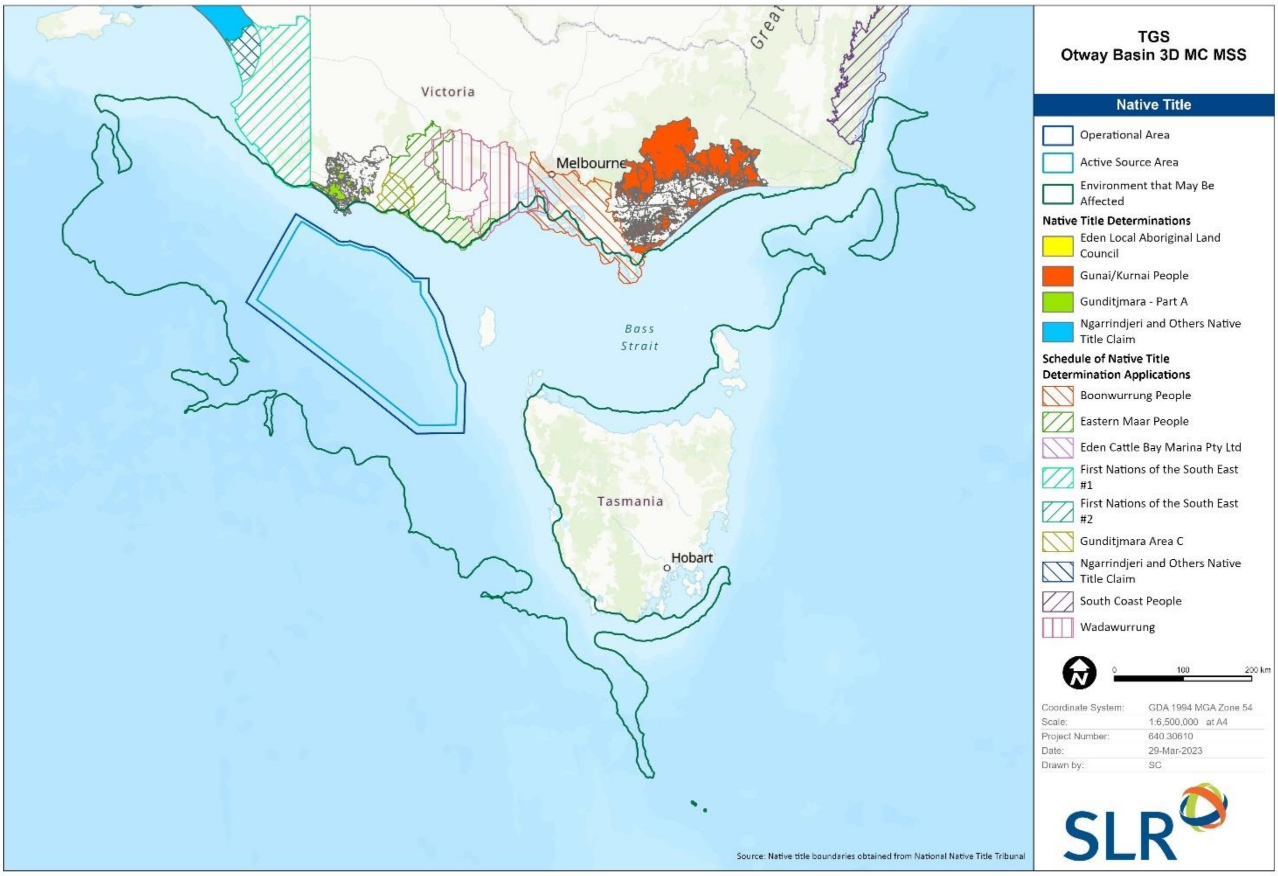
The NNTR search did not display any areas under application or with active cases in TAS, despite the current presence of Traditional Owner Groups (**Section 5**).

Table 33 Native Title Determination Consent Areas and areas under current application (Accepted for Registration status) intersecting or in close proximity with the EMBA

Tribunal File No. Federal Court File No. / Determination or Date Accepted for Registration	State/Territory/ Description	Short Name / Registered Native Title Body Corporate
South Australia		
TFN: SCD2017/002 FCF: SAD6027/1998 Date Determined: 14/12/2017	South Australia. Coastal boundary extending from the Coorong at Mill Lake, northwards to Cape Jervis. Native Title Determination Area does not have direct contact with the EMBA boundary, but is in close proximity.	Ngarrindjeri and Others Native Title Claim RNTBC: Ngarrindjeri Aboriginal Corporation RNTBC
TFN: SC1998/004 FCF: SAD6027/1998 Accepted for Registration: 28/10/2016	South Australia.	Ngarrindjeri and Others Native Title Claim RNTBC: Ngarrindjeri Aboriginal Corporation RNTBC
SC2017/002 SAD211/2017 Accepted for Registration: 10/11/2017	South East South Australia near the VIC border, extending north-west to Tilley Swamp, Coorong National Park. EMBA boundary coincides with shoreline/coastal edge of the application area close to the VIC border.	First Nations of the South East #1 RNTBC: To be confirmed pending assessment of registration
Victoria		
TFN: VCD2007/001 FCF: VID6004/1998, VID655/2006 Date Determined: 30/03/2007	VIC. Eumerella (Yumbuk) Coastal Reserve (in line with Boundary Rd , Tyrendarra East), extending to Oxbow Lake entrance, next to SA border Native Title Determination Area has shoreline contact with outer edge of the EMBA.	Gunditjmara - Part A RNTBC: Gunditj Mirring Traditional Owners Aboriginal Corporation RNTBC

Tribunal File No. Federal Court File No. / Determination or Date Accepted for Registration	State/Territory/ Description	Short Name / Registered Native Title Body Corporate
TFN: VCD2011/001 FCF: VID6004/1998, VID655/2006 Date Determined: 27/07/2011	VIC. Lady Julia Percy Island; Eumerella (Yumbuk) Coastal Reserve , extending west to be in line with Boundary Rd , Tyrendarra East Native Title Determination Area has shoreline contact with outer edge of the EMBA.	Gunditjmara & Eastern Maar RNTBC: Gunditj Mirring Traditional Owners Aboriginal Corporation RNTBC, Eastern Maar Aboriginal Corporation RNTBC
TFN: VCD2010/001 FCF: VID6007/1998, VID482/2009 Date Determined: 22/10/2010	VIC. Corner Inlet/Wilson Promontory National Park to opposite Marlo Coastal Reserve, mouth of the Snowy River. EMBA does not extend to shoreline, but is in close proximity.	Gunai/Kurnai People RNTBC: Gunaikurnai Land & Waters Aboriginal Corporation RNTBC
TFN: VC2012/001 FCF: VID21/2019 *Date Determined 28/03/2023[#]	Yambuk, extending east to Aireys Inlet along the coast. EMBA intersects with the coastal southern boundary of the application area.	Eastern Maar People Eastern Maar Aboriginal Corporation RNTBC
TFN: VC2022/002 FCF: VID693/2022 *Currently identified for Registration Decision (new decision in progress)	Wongarra coastline, extending easterly to Point Lonsdale, including Swan Island. Seaward extent of the application area intersects with the EMBA.	Wadawurrung RNTBC: To be confirmed pending assessment of registration
New South Wales		
TFN: NC2017/003 FCF: NSD1331/2017 *Accepted for registration 31/01/2018	Seaward of Edrom, extending north to Cuttagee. Seaward extent of the application area adjacent to the eastern extent of the EBMA.	South Coast People RNTBC: To be confirmed pending assessment of registration

[#] As reported in the media (*The Age* online and *ABC News*, 28 March 2023) as being Determined as Native Title. Pending NNTT website update.



Note- The Eastern Maar area was announced as Native Title Determination on 28 March 2023, updated data files showing the Determined Area from NNTTR are pending.

Figure 45 Native Title Determination Areas

4.6.1.2 Traditional Use

Indigenous occupation of coastal areas adjacent to the SEMR dates back at least 40,000 years (CoA, 2015). Historically, Indigenous peoples in the SEMR fished and collected shellfish, and seals and mutton birds were reported as important food sources. In some places along the VIC coastline there is evidence of nodules of marine chert (a kind of flint) which were washed ashore and provided raw material for stone tools. In the Coorong area of South Australia, mesh nets, woven fish traps, spears and canoes were developed to exploit marine resources (CoA, 2015). Thus, Indigenous peoples' connections with 'Sea Country' are regarded as equally important as connections with the land (CoA, 2015). Indigenous communities of the SEMR continue to have a strong cultural and spiritual connection to the ocean and to use ocean resources for food, traditional purposes, and income.

Sea Country is of particular importance for this EP, as the EMBA may extend into areas of known Sea Country. Sea Country is all estuaries, beaches, bays, and marine areas collectively, within a traditional estate. Sea Country contains evidence of the ancient mystical events by which all geographic features, animals, plants, and people were created. Sea Country contains sacred sites and contains tracks (or song lines) along which mythological beings travelled during the creation period (Smyth and Isherwood, 2016).

Indigenous peoples use and actively manage the coastal and marine environments of the region as a resource and to maintain cultural identity, health, and wellbeing, including within conservation areas such as Commonwealth, Australian and State Marine Parks. It is recognised that spiritual corridors extend from terrestrial areas into nearshore and offshore waters, that many marine animals are totems for Indigenous people, and that songlines pass through marine parks (CoA, 2015). The maintenance of culture and heritage through ritual, stories and traditional knowledge continue to be important uses of Land and Sea Country (CoA, 2015).

Aboriginal people's physical relationship with offshore waters was historically based on travel to islands, and the use and management of coastal species that are part of ocean ecosystems. The relationship between Indigenous people and the SEMR began when sea levels were much lower – a land bridge (Bass Strait) allowed movement of people between "mainland" Australia and TAS, and local Indigenous people were able to harvest species and utilise parts of the region that are now covered by deeper offshore waters (CoA, 2015). As sea levels rose with the end of the most recent ice age (ca 13,000 years ago) the land bridge became inundated. Current sea levels stabilised ca 5,000 years ago, isolating TAS from the mainland (National Oceans Office, 2002).

The OA does not include submerged islands or the submerged land bridge between the mainland and TAS (Bass Strait), however, TGS acknowledges Traditional Owners' Sea Country and a wider spiritual connection, and connection between Indigenous people, land, sea and resources. TGS also understands that while marine resources used by Indigenous people are generally limited to coastal waters for activities such as fishing, hunting and maintenance of culture and heritage, many Aboriginal groups, through their Sea Country relationships, have a direct interest in decisions affecting the management of deeper offshore waters.

The Traditional Owners of Country adjacent to the OA include the Buandig People whose Country includes the coastal area from the south of Robe to the area around the mouth of the Glenelg River at Nelson, VIC (AIATSIS, 2023). The Gunditjmara people are the traditional owners of the coastal area extending from Portland in the south, Port Fairy, Warrnambool and inland into Camperdown (Gunditjmara Aboriginal Cooperative Limited, 2022; AIATSIS, 2023). The Eastern Maar are Traditional Owners of south-western VIC, their land encompassing Warrnambool, Port Fairy, and the Great Ocean Road areas, stretching 100 m out to sea from low tide (Eastern Maar Aboriginal Corporation, 2020). The Peerapper (North West Tribe) of the Palawa people are the Traditional Owners of Lutruwita (TAS) (AIATSIS, 2023).

A review of the publicly available information on VIC and TAS Aboriginal cultural heritage databases confirm that there are no known indigenous heritage sites within the OA. Indigenous heritage and archaeological sites occur in coastal areas throughout the wider EMBA. Site specific characteristics and exact locations are not individually identified here. General area descriptions (e.g. as per the Victorian Aboriginal Cultural Heritage Register and Information System) demonstrate sites are located along the entire VIC coastline. It is assumed similar coastal distribution extends to South Australia, NSW and across the TAS coastline in contact with the EMBA.

Indigenous Protected Areas[6] (**IPAs**) are recognised areas of Land and Sea Country managed by Indigenous groups in accordance with Traditional Owners' objectives to deliver biodiversity conservation outcomes for the benefit of all Australians. The National Indigenous Australians Agency (**NIAA**) online register[3] was reviewed to identify IPAs that may be located within the EMBA. IPAs located within the EMBA are identified as:

- Deen Maar IPA (VIC), including Deen Maar Island (Lady Julia Percy Island), has a strong spiritual and visual connection with the Traditional Owners as the place where Bunjil, the Creator, left this world (NIAA website, accessed March 2023);

[6] https://www.niaa.gov.au/indigenous-affairs/environment/indigenous-protected-areas-ipas

- Preminghana IPA (TAS) protects historic Aboriginal engraving sites and the endangered Preminghana daisy;
- Badger Island IPA and Mount Chappell Island IPA (TAS) are located just outside the EMBA, off Flinders Island.

4.6.2 European and Marine Heritage

The coastline, reefs, and seabed of the State waters adjacent to the SEMR are the resting places of many shipwrecks, including wooden sailing ships, early whaling ships, passenger ships and fishing vessels (CoA, 2015). Hundreds of shipwrecks have been recorded in the waters of south-eastern Australia. Historic shipwrecks, sunken aircraft and associated relics are recognised and protected under the Underwater Cultural Heritage Act 2018. Under the act, all wrecks and sunken aircraft more than 75 years old are protected, together with their associated relics regardless of whether their actual locations are known. The Commonwealth Minister responsible for the environment can also make a declaration to protect any historically significant wrecks or artifacts and relics that are less than 75 years old.

A search of the Australasian Underwater Cultural Heritage Database (DoCCEEW online[7]) indicates that there are four known historic shipwrecks in the OA (**Table 34**, **Figure 46**). There are no known sunken aircraft within the OA identified on the database. Four Underwater Cultural Heritage Protected Zones are identified along the northeastern extent of the EMBA, along the VIC coastline. These include: SS Alert (1893), Clonmel (1841), SS Glenelg (1900), and SS Federal (1901) (DoCCEEW online)

Throughout the EMBA, lighthouses also constitute a major part of southern Australia's marine cultural heritage (CoA, 2015). The first commercial fishing ventures of European settlers focused of harvesting seals and whales (CoA, 2015). Within the EMBA, whaling stations were set up at places such as Portland, Port Fairy in VIC, Victor Harbour in South Australia, and Recherche Bay and Southport in TAS (CoA, 2015). The Davidson Whaling Station near Eden, NSW, at the most easterly extent of the EMBA is considered by some as one of the first industrial complexes in Australia.

Seventeen State protected Heritage Sites/Rivers/Agreements were identified within the EMBA within the EPBC Act Protected Matters Report. This includes nine Heritage Agreements (all in South Australia), five historic sites (all in TAS), and three Heritage Rivers (within VIC) (**Table 35**)

Table 34 Historic Shipwrecks Located within the Operational Area

Vessel Name	Vessel Type	Date Wrecked	Wreck Location
Tubal Cain	Unknown	1862	200 miles W.S.W of Cape Otway
Freak	Sailing	1834	N.W. coast of TAS
British Admiral	Sailing	1874	British Admiral Reef, King Island
John Ormerod	Unknown	1861	Discovery Bay, 30 miles W. of Portland

[7] https://www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage/auchd

Table 35 Heritage Rivers and Historic Sites Identified within the EMBA (Heritage Agreements in South Australia not listed)

State	Reserve Type	Protected Area Name
Victoria	Heritage River	Bemm, Goolengook, Arte and Errinundra Rivers
Victoria	Heritage River	Aire River
Victoria	Heritage River	Glenelg River
Tasmania	Historic Site	Strahan Customs House
Tasmania	Historic Site	D'Entrecasteaux Watering Place
Tasmania	Historic Site	Cape Sorell
Tasmania	Historic Site	Currie Lightkeepers Residence
Tasmania	Historic Site	Macquarie Harbour

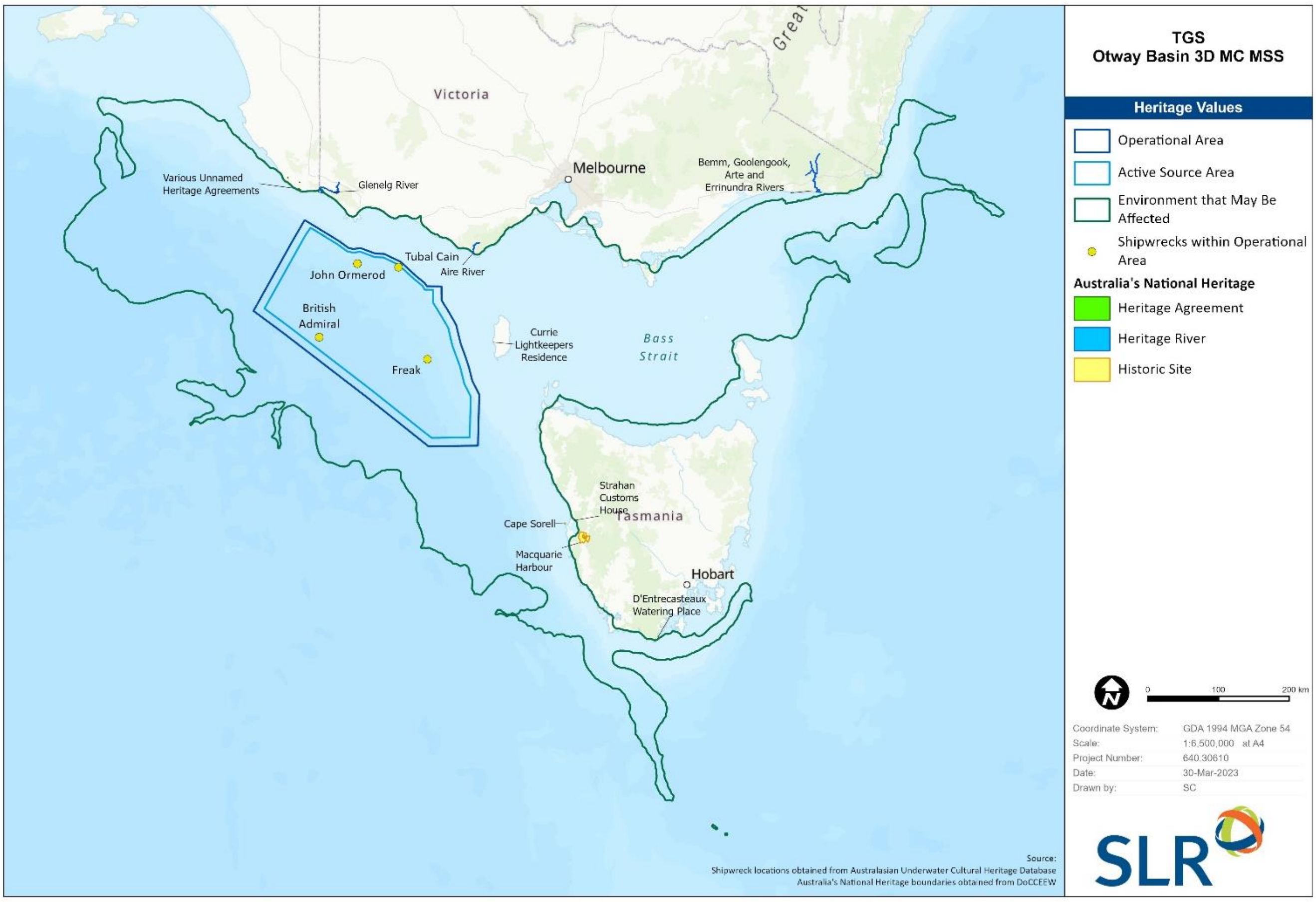


Figure 46 Places of Marine Heritage including Shipwrecks and Aircraft Wrecks

4.7 Socio-Economic Environment

4.7.1 Coastal Settlements

Coastal settlements and urban centres (as defined by the Australian Bureau of Statistics) are spread across most the entire extent of the EMBA across the mainland from South Australia to the eastern boundary of VIC and NSW.

In the southern area of South Australia within the EMBA, Port MacDonnell is a small urban centre close to the VIC border. Further northwest in South Australia, Southend is coastal urban centre located at the northern extent of Canunda National Park, but not within the EMBA boundary itself.

Across the VIC coast, coastal urban centres include Portland, Port Fairy, Warrnambool, Peterborouh and Port Campbell all to the west of Otway. To the east includes Marengo, Apollo Bay, Lorne, Aireys Inlet, Anglesea, Jan Juc, Torquay, Barwon Heads, Point Londsdale, St Leonards and Portarlington within the defined EMBA. East of the Mornington Peninsular towards Wilsons Promontory, coastal urban centres include Cape Schank, Flinders, Phillip Island, San Remo, Kilcunda, Cape Patterson, Inverloch, Venus Bay and Sandy Point. Further east from Wilsons Promontory, coastal urban centres include Golden Beach/Paradise Beach, Lakes Entrance, Lake Tyers Beach, Marlo, and Mallacoota in close proximity to the northeastern boundary of the EMBA (ABS, 2023).

In TAS (including King Island), coastal urban areas located within the EMBA, or in close proximity include Currie (King Island), and Strahan (Northwest TAS).

Where limited information was available on the extent, population, and socio-economic environment for community settlements, including indigenous community settlements, the precautionary principle has been applied and assumed a direct association with the marine environment. To this end, potential impacts to these coastal settlements has been evaluated and managed through consultation with the nominated State Government and the Traditional Owners Representatives (see **Section 5**).

4.7.2 Tourism and Recreation

The SEMR offers a wide and diverse range of opportunities for marine based tourism and recreational activities, including snorkelling, scuba diving, surfing, kayaking, whale and wildlife watching, sailing and charter boat cruises. Popular tourist destinations include Phillip Island and the Great Ocean Road (VIC), Robe and Beachport (South Australia) and Strahan and the Freycinet Peninsula (TAS) (CoA, 2015).

Marine National Parks or Marine Sanctuaries encompass over 5% of VIC coastal waters, and provide areas for recreational activities including swimming, surfing, snorkelling, scuba diving and boating (Travel Victoria, 2023). Scuba diving on shipwrecks occurs at Apollo Bay, Warrnambool, and Port Campbell. Vessel based sightseeing tours include fur seal tours at Cape Bridgewater and Lady Julia Percy Island, tours of Portland Harbour and Lawrence Rocks, and whale and dolphin cruises around Phillip Island. Land-based whale watching occurs along the Great Ocean Road at Warrnambool and Portland. Phillip Island is also home to the largest little penguin colony in the word, which attracts tourists nightly to watch the 'penguin parade'.

Key locations for tourism in SA include Kangaroo Island, the coasts of the Fleurieu, Yorke and Eyre Peninsulas, offshore islands and the GAB Marine Park. Tourism activities include sailing, swimming, whale and wildlife watching, scuba diving and recreational fishing. Sea lion and dolphin swim tours operate along the coast, including off Kangaroo Island. The Neptune Islands, off Spencer Gulf is renowned for cage diving with great white sharks. Whale watching for migrating humpback and southern right whales is popular at Victor Harbour and in the GAB during the winter months.

The west coast of TAS is largely inaccessible and unpopulated, attracting low numbers of mainly shore-based bushwalkers and fishers. King Island tourism is predominantly centred on walking, surfing, and dining on local fresh produce.

4.7.2.1 Whale Watching

Migration southern right whales and blue whales attract visitors to the VIC coastline from approximately May to early October. The coastline encompassing Portland and Warrnambool offer some of the best shore-based whale watching locations atop cliff tops, rocky outcrops, and purpose-built viewing platforms (Visit Victoria, 2018a). At the southern right whale nursery grounds offshore from Logan's Beach in Warrnambool, whales can be observed from within 100 m of the coastline from viewing platforms (Visit Victoria, 2023a). In Portland, popular viewing locations include off the coast from Cape Bridgewater to Narrawong, Port of Portland and the cliffs above Nuns Beach and Portland Bay (Visit Victoria, 2023a). Blue whales rarely approach land; however, the headlands of Cape Nelson and Cape Bridgewater provide opportunities for viewing blue whales at a distance (Visit Victoria, 2023a). Offshore whale spotting is undertaken from helicopters and light planes, and occasionally vessels.

4.7.2.2 Diving

Recreational diving occurs inshore of the OA, and generally in water depths less than 30 m, concentrating around structures such as piers and shipwrecks, or natural reefs and rocky outcrops. While divers use these areas for sightseeing, many also dive to harvest target species such as abalone and rock lobster when in season. Several dive charters offer guided tours, operating out of ports inshore of the OA.

Despite the often-rough coastal conditions along the Great Ocean Road, several popular shore dive sites can be found including the breakwater and surrounding shipwrecks at Warrnambool, Stingray Bay (part of the Merri Marine Sanctuary), and Middle Island. Pickering and Thunder Point are also popular dive spots and are accessible from shore or boat. Surrounding Port Campbell are several popular dive sites based around shipwrecks, including some sites that are accessible only by boat (Visit Victoria, 2023a).

Visibility in TAS waters ranges from 12 m (summer) to more than 40 m (winter). Popular dive sites on the northwest of the island include Rocky Cape and Boat Harbour, and the many shipwrecks around King Island (Discover Tasmania, 2023a). These dive sites are typically only accessible by boat.

4.7.2.3 Cruise, Sailing and Boating Activity

Recreational boating is popular throughout Australia, with most boating activities occurring in bays and sheltered waters, although open waters are also utilised, including those greater than 5 NM from shore. Most recreational boating activities occur over summer months, with the least amount of boating activity in the cooler winter months (NMSC, 2009). All operators of registered recreational motorboats in SA, VIC, and TAS waters are required to hold a marine licence.

Recreational boat users in SA prefer open waters (NMSC, 2009), with most of the recreational boat use in SA occurring in the Spencer Gulf, Gulf of St Vincent, and around Kangaroo Island.

Boating is one of VICs most popular recreational activities, with over 417,000 VIC residents holding recreational vessel licences and more than one in ten VIC residents regularly participating in recreational boating. Recreational boating in VIC is concentrated at 20 key locations, with Port Phillip and Western Port the most heavily used. Coastal areas Portland, Warrnambool, Torquay, Barwon River, Anderson Inlet, Corner Inlet, and Mallacoota are also in the top 20 boating locations for VIC (the remaining locations are freshwater based) (DoT, 2021). Boating trips are mainly associated with fishing, with a small number of boaters launching for the purpose of touring/cruising. Recreational boating activity peaks from October to April although boating activities also continue throughout the ‘off season’ (May to September) (DOT, 2021).

On a per capital basis, TAS has the highest motorboat ownership across Australia (MAST, 2021). Exposed conditions along the west coast of TAS results in low boating activity, although the use of the marine environment increases around King Island due to shelter provided by the island.

The Melbourne to King Island Ocean Yacht Race between Queenscliff (VIC) and King Island (TAS) is held annually on the second weekend in March. The race starts off in Queenscliff and covers 114 NM to finish in Grassy Harbour, King Island. The race is run by the Ocean Racing Club of Victoria in conjunction with the King Island Boat Club (ORCV, 2023). The Ocean Racing Club of Victoria also runs two races at Christmas; the Melbourne to Hobart (‘Westcoaster’) yacht race which tracks across Bass Strait from Melbourne and along the west and south coasts of Tasmania before finishing in Hobart, and the Melbourne to Devonport yacht race which tracks south across Bass Strait.

4.7.2.4 Surfing

The Limestone Coast (from Kingston to the VIC border) supports heavy surf breaks that are typically only surfed by experienced surfers. Popular surfing areas include Robe, Beachport, Port MacDonnell, Cape Northumberland, Guichen and Rivoli Bays, Southend, Cullens, and Posties (Surfing Atlas, 2023).

Along the Great Ocean Road west of Cape Otway is Johanna Beach; one of the top surfing beaches in VIC. Other valued areas include Princetown, Gibson Steps, Port Campbell, and Peterborough, Lighthouse and Green Island, The Passage, and the reefs as Gabbos and Gooloos (Visit Victoria, 2023b). Further west around Warrnambool popular breaks include Logan’s Beach, The Flume, Levy’s Beach, East Beach, while hot spots for long surf breaks include Shelley beach, the water tower near Portland, Yellow Rock, Crumpets, and Whites Beach (Visit Victoria, 2023b). Although mid-December to mid-January (school holiday period) is the most popular time for surfing along the Great Ocean Road, autumn and winter (March – August) represent the best time of the year for surfing (Wildlife Tours, 2023).

Surfing opportunities along the northwest coast of TAS include challenging waves at Marrawah settlement (Ann Bay, Mawson Bay, and Green Point). Further north on King Island is Martha Lavinia Beach, which contains a unique wave that breaks both left and right and is referred to as ‘the jewel in the crown’. Across TAS, summer periods provide the mildest waves, with bigger waves arriving in winter (Discover Tasmania, 2023b).

4.7.2.5 Recreational Fishing

Recreational fishing is an important activity in Australia both socially and economically, with most recreational fishing occurring in state and territory waters. Recreational fishing in state waters is subject to state-specific rules and regulations including seasonal closures, licence requirements, and catch bag and size limits. Seasonal closures are often established to protect fished species during breeding seasons and may be permanent, seasonal, or temporary (PIRSA, 2022), although not all recreationally fished species are subject to seasonal closures. Recreational fishing clubs are found in each state, many of which run fishing competitions throughout the year.

Although recreational fishing occurs in all coastal waters in South Australia, most of the activity occurs in the Spencer Gulf, Gulf of St Vincent, and surrounding Kangaroo Island to the west of the OA, and at lower intensity along the Limestone Coast. Most recreational fishing is off privately-owned boats followed by land-based fishing off the shore and rocks (rather than off public wharves/jetties) (Giri and Hall, 2015). In a survey of South Australian recreational fishermen, approximately 67% fished within 5 km of the coastline, while approximately 45% utilised offshore waters (> 5 km from shore). In the south-east of South Australia, fishing effort is relatively evenly spread along the coast, with highest effort around Kingston/Robe and lowest effort off the Coorong beaches (Giri and Hall, 2015). Commonly targeted species in SA include blue swimmer crab, King George whiting, Australian herring, pipi, garfish, squid, striped trumpeter, snapper, Australian salmon, mulloway, and scallops, with Australian herring and King George whiting the most caught finfish (Giri and Hall, 2015).

Rock lobsters are also recreationally targeted in SA waters, with fishermen allowed to use drop nets, pots, or SCUBA to take lobsters during the open season (Linnane *et al*., 2018). Abalone are also caught by snorkelling or SCUBA diving (PIRSA, 2012).

VIC has the third highest number of people participating in recreational fishing in Australia, although this is likely a reflection of its relatively large population size (Henry and Lyle, 2003). Port Phillip Bay (northeast of the OA) is the most important embayment in VIC for recreational fishing (Ford and Gilmour, 2013), and is indicative of the species targeted by recreational fishermen throughout VIC waters. More than 62 species are recreationally caught in Port Phillip Bay, including finfish, sharks, and shellfish, with the most targeted species being King George whiting, flathead, snapper, garfish, Australian salmon, and gummy shark (Ford and Gilmour, 2013). Although recreational fishing occurs year-round, Ford and Gilmour (2013) suggest November – April is the peak fishing period based on Port Phillip Bay catch.

Recreational fishing is a popular past time in TAS, with at least 120,000 Tasmanians fishing at least once a year. The west and northwest coast of TAS support comparatively lower levels of recreational fishing than the TAS east coast (Lyle *et al*., 2009). Shore-based fishing along this coast is more prevalent than boat-based fishing. Although most boating effort occurs 5 km or less from shore, some fishermen target waters more than 5 km from shore. The main target species along the TAS west coast are rock lobster, abalone, and trumpeter. Rock lobster catch is predominantly from inshore waters from November to March, with fishing activity peaking immediately following the season opening in November. Offshore fishing targets mid-depth reef associated species such as striped trumpeter, and deepwater shelf-edge associated species such as blue-eye trevella (Tracey *et al*., 2020a). Abalone catch generally occurs during summer and autumn, peaking in December and January (Lyle *et al*., 2009). Game fishing for pelagic sharks (primarily mako shark) also occurs off the northwest coast of TAS over summer months (Tracey *et al*., 2013).

A survey of recreational fishing for southern bluefin tuna in Australia estimated a catch of 270 t in 2018–19 (Tracey *et al*., 2020b), and 5% of Australia's quota allocation for this species is set aside for mortality associated with recreational fishing (Bulman *et al*., 2020). Tuna fishing in TAS waters has generally been restricted to off the east coast (Lyle *et al*., 2009), although waters both east and west of Tasmania may present fishing opportunities year-round. In VIC, tuna are targeted in the offshore waters along the coastline, with southern bluefin tuna the main focus of recreational fishermen and charter operators, including waters on the outer continental shelf (Bulman *et al.,* 2020). While the timing of the tuna season varies on an annual basis, tuna are typically present along the coast from late summer through to early winter, possibly associated with upwelling systems. Tourism activities associated with the tuna industry are particularly important for the town of Portland, VIC, with several charter vessels, as well as privately owned boats, operating out of the town. Engagement with Tuna Australia suggests up to 350 – 400 boats targeting southern bluefin tuna use Portland, Port Fairy, and Warrnambool as staging areas. In February and March 2023, recreational landings of southern bluefin tuna were high at all western VIC ports and in Bass Strait. Landed fish in Bass Strait averaged 20 – 25 kg and were being caught in water depths less than 20 m, and in some cases from the shore (Tuna Australia, 2023).

Charter boats provide a commercial platform for recreational fishing activities and attract valuable income into coastal regions. Fishing charters generally operate from most coastal towns where they target reefs, seagrass meadows, unvegetated soft bottom, sheltered beaches and tidal flat habitats (PIRSA, 2011), while primary target species for charter vessels generally mirrors those that are targeted by recreational fishers. Charter operators are still required to comply with recreational fishing restrictions and prohibitions, such as seasonal closures, minimum and maximum sizes, and catch limits.

4.7.3 Commercial Fisheries

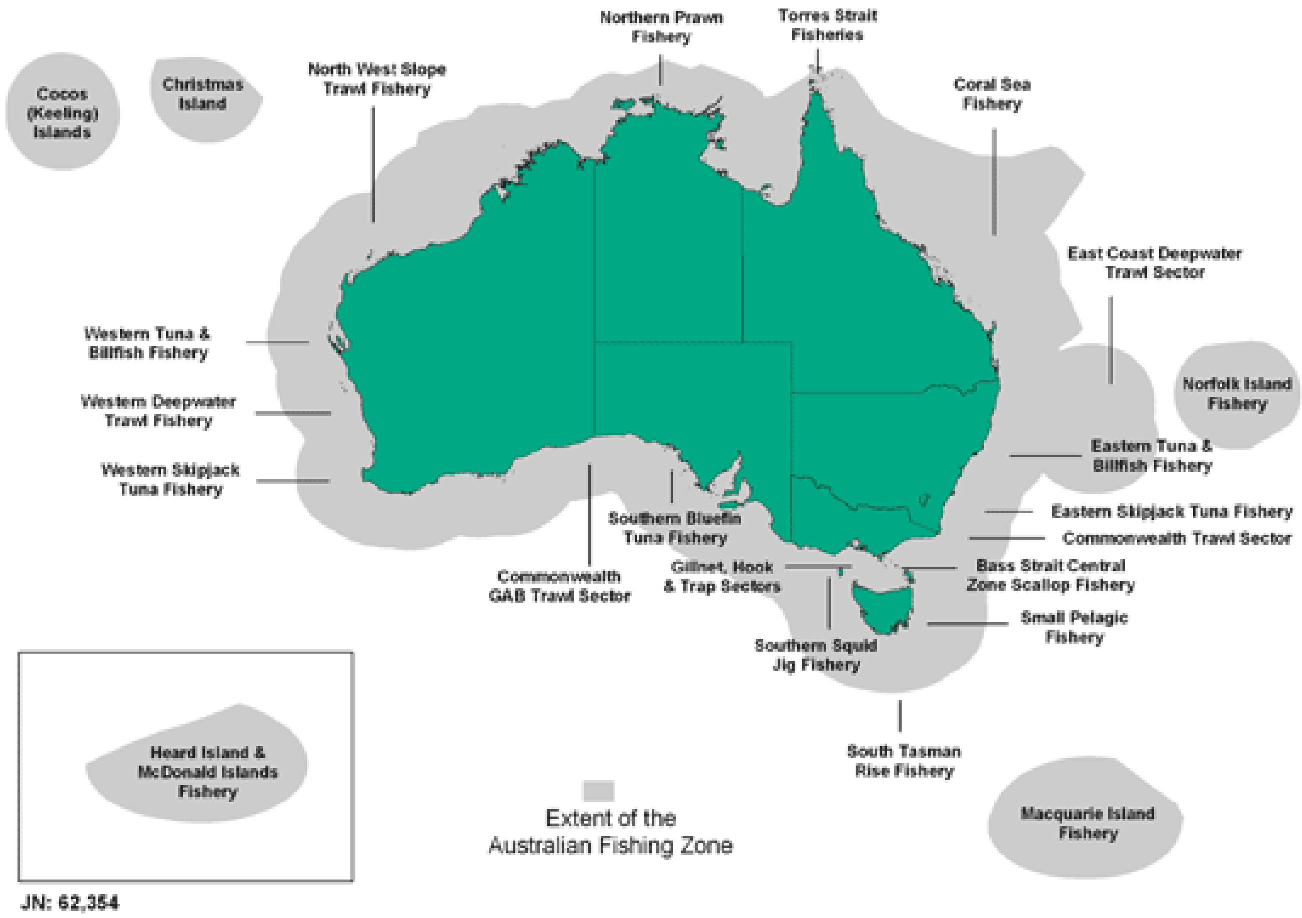
Australia's fisheries are those that occur within the Australian EEZ (waters out to 200 NM from coastal baselines). Boundaries within Australia's fisheries have been established to simplify jurisdiction (DoAWR, 2002). Fisheries are either:

- Commonwealth managed fisheries – those in Commonwealth waters between 3 NM and 200 NM from the coastline. Commonwealth waters are covered by the Australian Fishing Zone (**Figure 47**) (DoAWR, 2023) and are managed through the Australian Fisheries Management Authority (**AFMA**); or
- State managed fisheries – those in inshore waters out to 3 NM. Jurisdiction is vested in the adjacent State or Territory.

Where a fishery falls within multiple jurisdictions, an Offshore Constitutional Settlement arrangement is generally developed, whereby sole responsibility is passed to one jurisdiction. Alternatively, a Joint Authority may be formed, allowing for the co-management of the fishery through the legislation of one jurisdiction (DoAWR, 2002).

Commercial fishing within the OA and EMBA is comprised of Commonwealth-managed fisheries and VIC, TAS, South Australian, and some NSW State-managed fisheries and these are discussed in the following sections.

The interests of several Commonwealth-managed fisheries are represented by peak industry bodies. Details on industry bodies (where available) are provided with a record of all consultation carried out by TGS provided in **Section 5** and full transcripts in **Appendix H** of this EP.



Source: DoAWR, 2023

Figure 47 Australian Fishing Zone and Location of Commonwealth Fisheries

4.7.3.1 Review of Catch and Effort Data

Not all of the commercial fisheries identified with management areas overlapped by the EMBA are active within the OA. Commercial fishing catch and effort data for the recent five-year period 2016 – 2020 was obtained from the Australian Bureau of Agricultural and Resource Economics and Sciences (**ABARES**), Victorian Fisheries Authority (**VFA**), Department of Natural Resources and Environment Tasmania (**DNRET**) and Department of Primary Industries and Regions, South Australia (**PIRSA**) and has been reviewed to further understand the fisheries that are active in waters overlapping and adjacent to the OA.

Commonwealth fisheries effort is provided for a grid system based on divisions of approximately 1 arc hour latitude (approximately 60 NM), therefore, the data is of a coarse resolution and accurate fishing locations are not always apparent. For blocks where five or more vessels have fished per year, it has been possible for ABARES to map areas of relatively low, medium and high intensity fishing effort. For reporting blocks where fewer than five vessels have fished per year, detailed data remains confidential and ABARES have not mapped areas of relative fishing intensity; only the blocks are presented.

VIC fishing effort data is provided for a grid system based on divisions of 10' latitude (approximately 10 NM).

TAS fishing effort data is provided for a grid system based on divisions of 30' latitude (approximately 30 NM). Fishing effort and catch data was confidential for blocks where less than five boats had fished in a year. For some fisheries, this meant that the amount of relative effort or catch that could be mapped for each year of the five-year period was limited, but the presence or absence of catch is captured. Data was provided only for ten blocks that overlap or are adjacent to the OA; data for the wider fisheries was not provided so it is not possible to comment on relative fishing effort in the context of whole fisheries.

South Australian fishing effort data is provided for a grid system based on divisions of approximately 1 arc hour (approximately 60 NM). Fishing effort and catch data was confidential for blocks where less than five licences had fished in a year. For some fisheries, this meant that the amount of relative effort or catch that could be mapped for each year of the five-year period as a whole was limited, but the presence or absence of catch is captured. Data was provided for the South East Marine Fishing Area and Southern Zone of the Rock Lobster Fishery.

In addition to reviewing fishing effort data, TGS commissioned the South East Trawl Fishing Industry Association (**SETFIA**) to compile an additional review of the level of catch made by Commonwealth and State-managed fisheries within the OA, the proportion of each fisheries' total allowable catch and the annual average catch value that it represents (based upon data from the ten years prior to 2021).

The results the TGS and SETFIA catch data reviews are presented throughout the corresponding sections for each fishery. Note that the values presented represent the catch overlapped by the entire OA; given that the Otway Basin 3D MC MSS will be acquired in phases comprising more discrete areas, the area of effort, catch and its corresponding value overlapped during survey activities is likely to be significantly less. The information presented within this EP also encompasses the original OA, prior to the reduction of the OA from South Australian waters.

4.7.3.2 Commonwealth Managed Fisheries

The AFMA manages Australian fisheries on behalf of the Commonwealth Government from 3 NM to the edge of the Australian Fishing Zone. AFMA was established under the *Fisheries Administration Act 1991*, and it is under this Act, as well as the *Fisheries Management Act 1991*, that AFMA is invested with its objectives, functions, and powers.

AFMA looks after Commonwealth fisheries through:

- Research and science which provides the information to manage fisheries, such as the setting of quota levels;
- Management and regulation that develops and makes the rules for fisheries (e.g. quota and gear restrictions, and issuing of permits); and
- Monitoring and enforcement of rules and regulations.
- The aim of AFMA is to keep fish species, and the marine environment, in good health for the future. To achieve this, they work together with Australian State agencies, international counterparts, industry, scientists, and recreational and environmental fishery stakeholders (AFMA, 2023b).

AFMA ensures that impacts on commercial fisheries from petroleum activities, including MSSs, are considered by providing comment directly to the Department of Industry, Innovation and Science on annual acreage releases, and by providing comment to petroleum companies on proposals that may have significant impacts on fisheries. AFMA expects petroleum operators to consult directly with fishing operators about proposed petroleum activities. AFMA can provide data on fisheries but does not represent fishers. Note that in some fisheries there are no associations (AFMA, 2023c).

Consultation with commercial fishers that may be affected by the Otway Basin 3D MC MSS has been guided by AFMA recommendations and expectations. See **Section 5** and **Appendix H** for details on consultation with the commercial fishing sector.

Commonwealth-managed fisheries with management boundaries that overlap with the OA and EMBA include:

- Southern and Eastern Scalefish and Shark Fishery (**SESSF**);
- Small Pelagic Fishery (**SPF**);
- Southern Squid Jig Fishery (**SSJF**);
- Eastern Tuna and Billfish Fishery (**ETBF**);
- Southern Bluefin Tuna Fishery (**SBTF**);
- Bass Strait Central Zone Scallop Fishery (**BSCZSF**).

These fisheries are further described in **Section 4.7.3.2.1** to **Section 4.7.3.2.6**. Commonwealth fisheries that do not overlap with the OA or EMBA have not been included within this EP.

4.7.3.2.1 Southern and Eastern Scalefish and Shark Fishery

The SESSF is a multi-sector, multi-gear and multi-species fishery that targets a variety of stocks. The management area for the SESSF covers almost half of the Australian Fishing Zone and spans Commonwealth waters and Australian state waters.

The following sectors are of relevance to the OA and EMBA:

- Commonwealth Trawl Sector (**CTS**);
- Scalefish Hook Sector (**SHS**); and
- Gillnet, Hook and Trap Sector (**GHTS**).

Commonwealth Trawl Sector

The CTS extends south from Barrenjoey Point in northern NSW to east of Kangaroo Island, South Australia, and targets a variety of fish and shark species. The main species landed in the 2020/21 fishing season included blue grenadier, flathead, orange roughy (eastern zone), pink ling, and eastern school whiting. Vessels predominantly use demersal otter trawl and Danish-seine fishing methods, although pair trawling and mid-water trawling methods are also permitted under the SESSF management plan, albeit rarely used (Patterson *et al*., 2021). The fishing season for the CTS occurs year-round from 1 May to 30 April.

During the 2020/21 fishing season, 34 otter-board trawlers were active in the CTS, with 51,165 hours of fishing effort reported. In the same fishing season, 20 Danish-seine vessels were active, reporting a fishing effort of 10,715 shots. A total catch of 18,985t was reported for the 2020/21 fishing season.

The main trawl effort undertaken near the OA is for the otter-board trawl sector of the CTS. Fishing effort data indicates that fishing effort is primarily concentrated on the outer continental shelf and upper slope in waters shallower than 700 m, or shallower than 1,000 m, depending on closure areas in the fishery. The OA overlaps with areas of low to high fishing intensity along the northern and southwestern boundary, with fishing also occurring across the OA albeit at low intensity (five or fewer vessels) (**Figure 48**). The OA overlaps approximately 4.6% of the total catch overlap with the CTS, equating to an average annual revenue overlap of $3,689,568. The EMBA also overlaps with areas of low to high fishing intensity parallel to the South Australia and VIC coast, surrounding TAS, and north from TAS along the VIC and NSW regions (**Figure 48**).

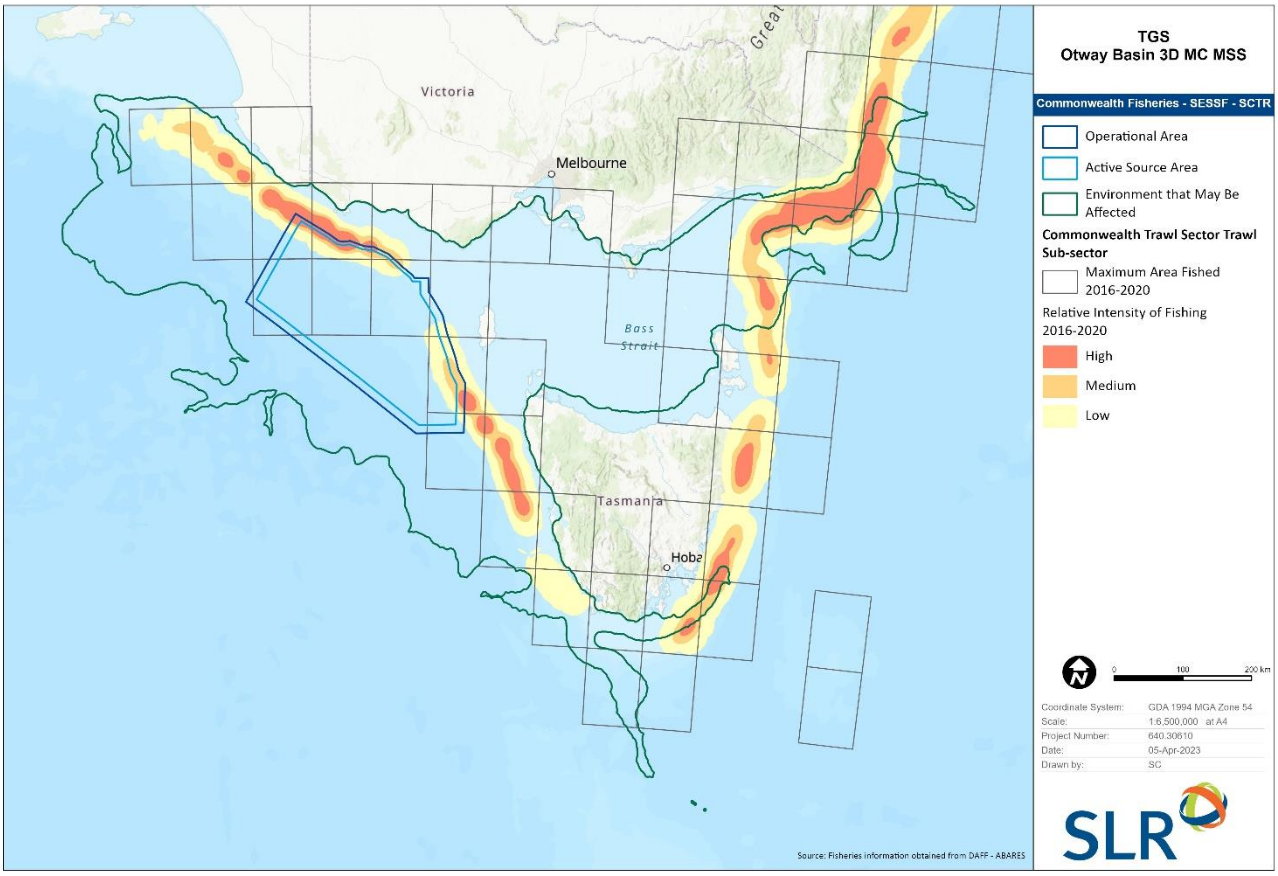


Figure 48 Relative Fishing Intensity in the Commonwealth Trawl Sector (2016 – 2020)

Scalefish Hook Sector

The SHS extends around south-eastern Australia to the border between South Australian and Western Australia. This fishery targets a variety of fish and shark species, with the main species landed in 2020/21 being pink ling, blue-eye trevalla, and ribaldo. Fish within this sector are caught using longline and dropline methods, some of which are automated (Patterson *et al*., 2021). The fishing season for the SHS occurs year-round from 1 May to 30 April.

For the 2020/21 fishing season, there were 20 active scalefish hook vessels, with a total fishing effort of 4.4 million hooks returning a total catch of 665t (Patterson *et al*., 2021).

Fishing effort data indicates that fishing effort is generally reported as <5 vessels per 60 NM reporting block, with only a few areas of fishing intensity mapped off southern and eastern TAS overlapping the EMBA (**Figure** 49). The OA overlaps approximately 7.3% of the total catch overlap with the SHS, equating to an average annual revenue overlap of $378,432.

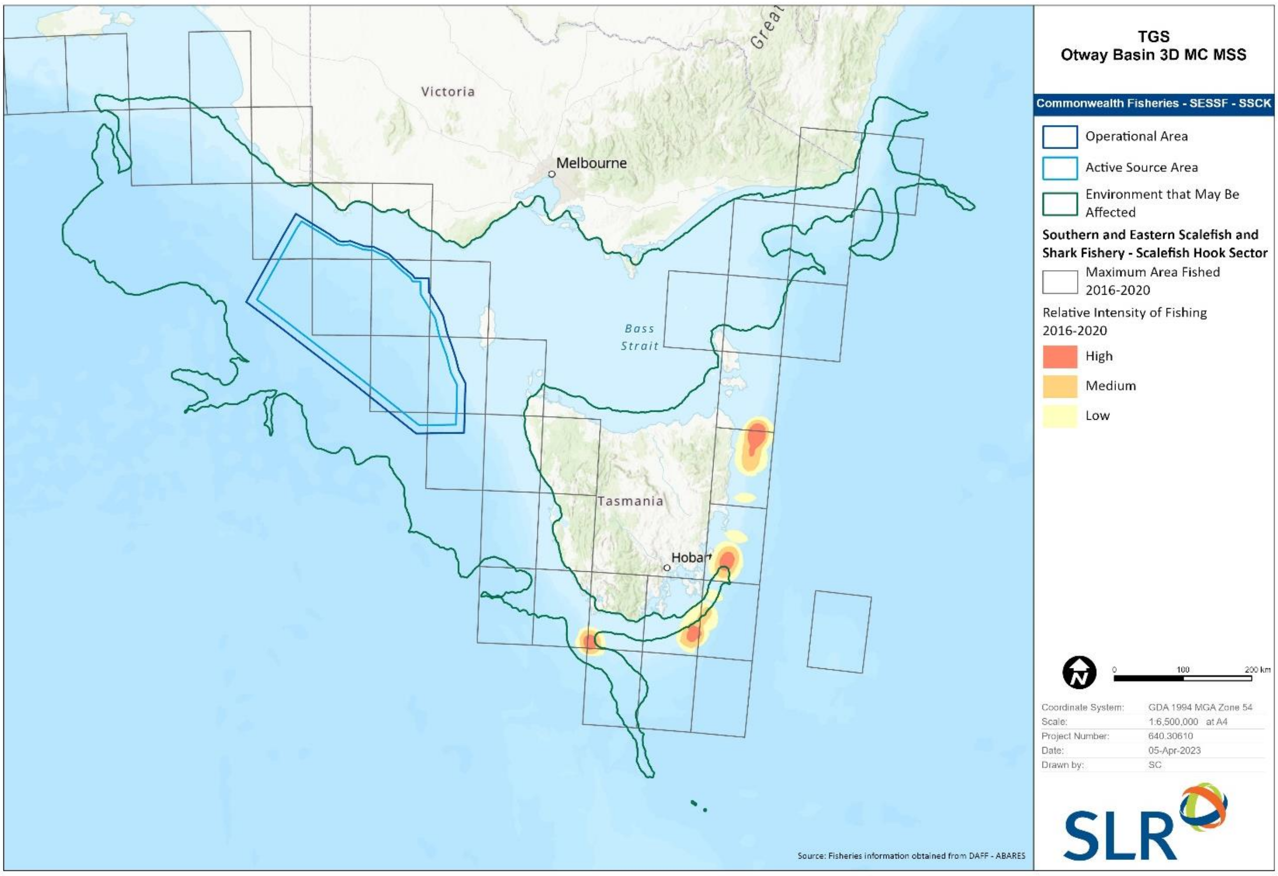


Figure 49 Relative Fishing Intensity in the Southern and Eastern Scalefish and Shark Fishery – Scalefish Hook Sector (2016 – 2020)

Gillnet, Hook and Trap Sector

The Shark Gillnet and Shark Hook Sectors (**SGSHS**) are part of the GHTS of the SESSF. Most net fishing in the SGSHS occurs in Bass Strait, while most hook fishing occurs off South Australia (Patterson *et al.*, 2021). Spatial closures (implemented since 2003) have resulted in gillnet effort being concentrated off VIC, with an increase in hook effort to replace gillnet effort off South Australia. The SGSHS utilises demersal gillnet and demersal longline fishing methods to target gummy sharks and sawsharks, with elephantfish caught as bycatch. The fishing season for the SGSHS extends from 1 May to 30 April.

During the 2020/21 fishing season, there were 13 hook permits and 38 active hook vessels, recording a hook effort of 2.88 million hooks. In the same season, there were 61 gillnet permits and 31 active gillnet vessels, hauling a gillnet effort of 27,782 km (Patterson *et al.*, 2021).

Fishing effort from the SGSHS within the OA is limited to relatively few vessels (<5 vessels per 60 NM block per year) (**Figure 50** and **Figure 51**). The OA overlaps approximately 0.2% of the total catch overlap with the SGSHS, equating to an average annual revenue of $38,670.

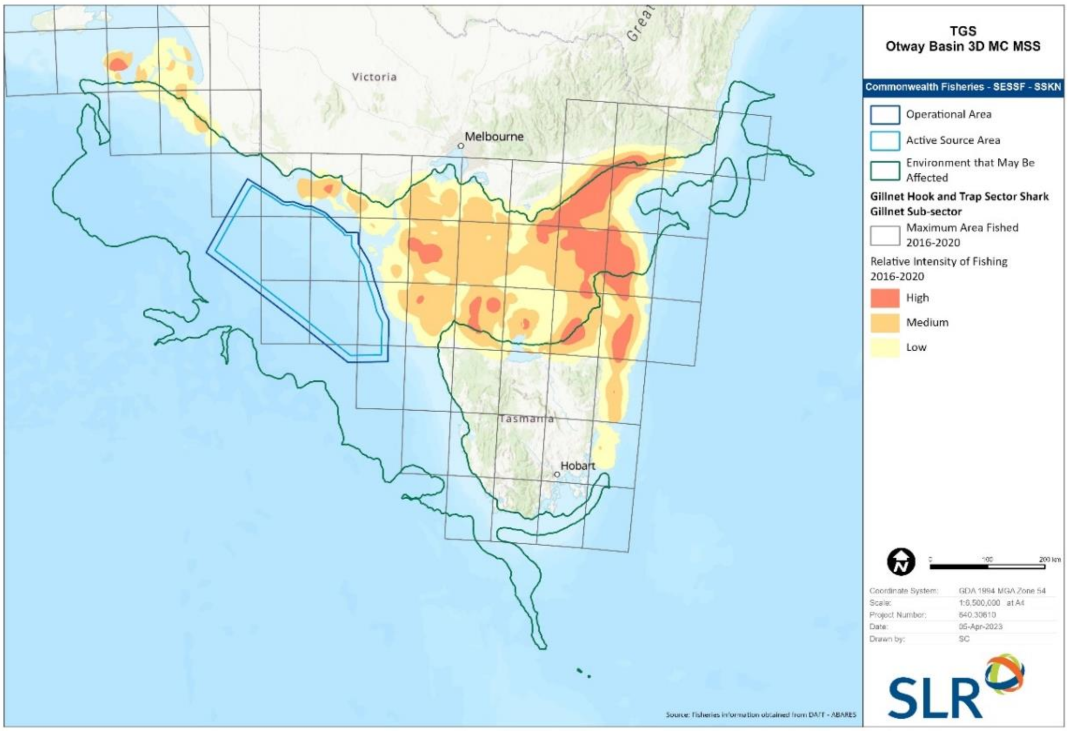


Figure 50 Relative Fishing Intensity in the Gillnet Hook and Trap (Shark Gillnet Sub-sector) Fishery (2016 – 2020)

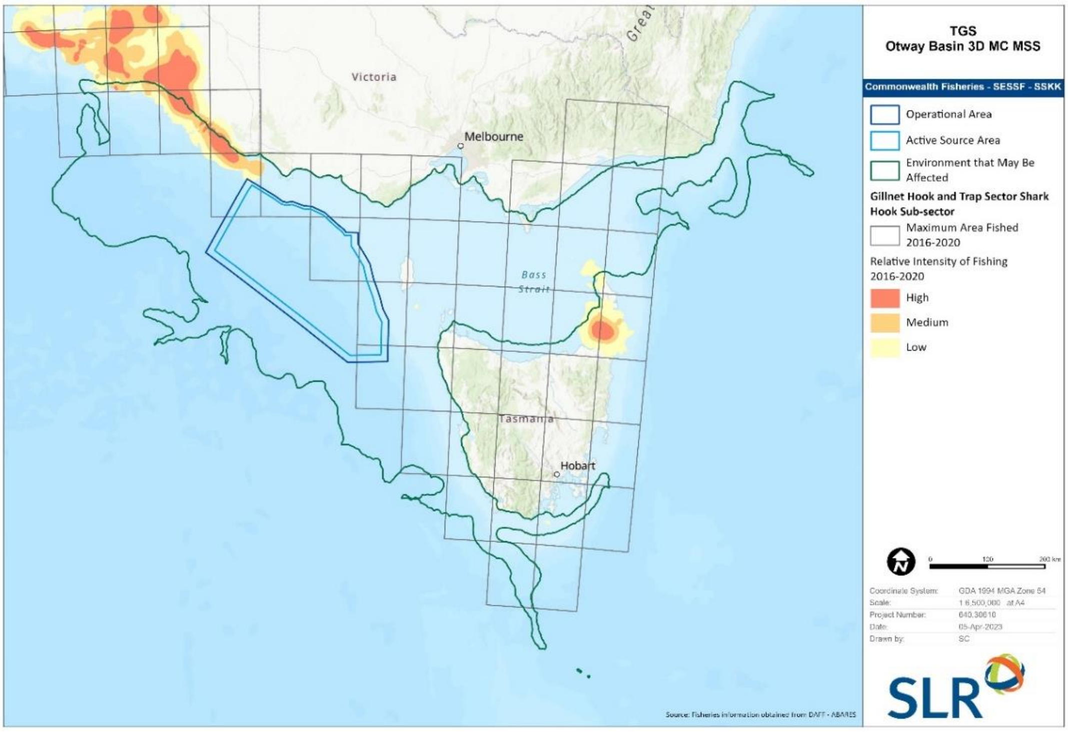


Figure 51 Relative Fishing Intensity in the Gillnet Hook and Trap (Shark Hook Sub-sector) Fishery (2016 – 2020)

4.7.3.2.2 Small Pelagic Fishery

The SPF extends from southern QLD to southern Western Australia. It has three subareas (east, west and sardine), with separate TACs for each of the seven stocks. The SPF includes purse-seine and midwater trawl fishing vessels targeting blue mackerel, jack mackerel, and redbait (in the east and west subareas), and Australian sardine in the sardine subarea (Patterson *et al*., 2021). The fishing season for the SPF is from 1 May to 30 April.

Historically, most fishing effort has occurred off the east coast of TAS and NSW. 31 entities held fishing permits during the 2019/20 and 2020/21 fishing seasons. Total catch was 16,093t over 200 hours, and 13,766t over 141 hours for the 2019/20 and 2020/21 seasons respectively (Patterson *et al*., 2021), representing a decrease in fishing effort between seasons.

Fishing effort is relatively low and limited to blocks with fewer than five vessels per 60 NM block per year. Recent fishing effort has mainly occurred off the coast of NSW and eastern TAS, although some effort between 2016 and 2020 has also occurred in waters off South Australia.

There has been no fishing associated with the SPF within the OA, however, the wider EMBA does overlap with fishing blocks where fewer than five vessels have fished in a year (**Figure 52**).

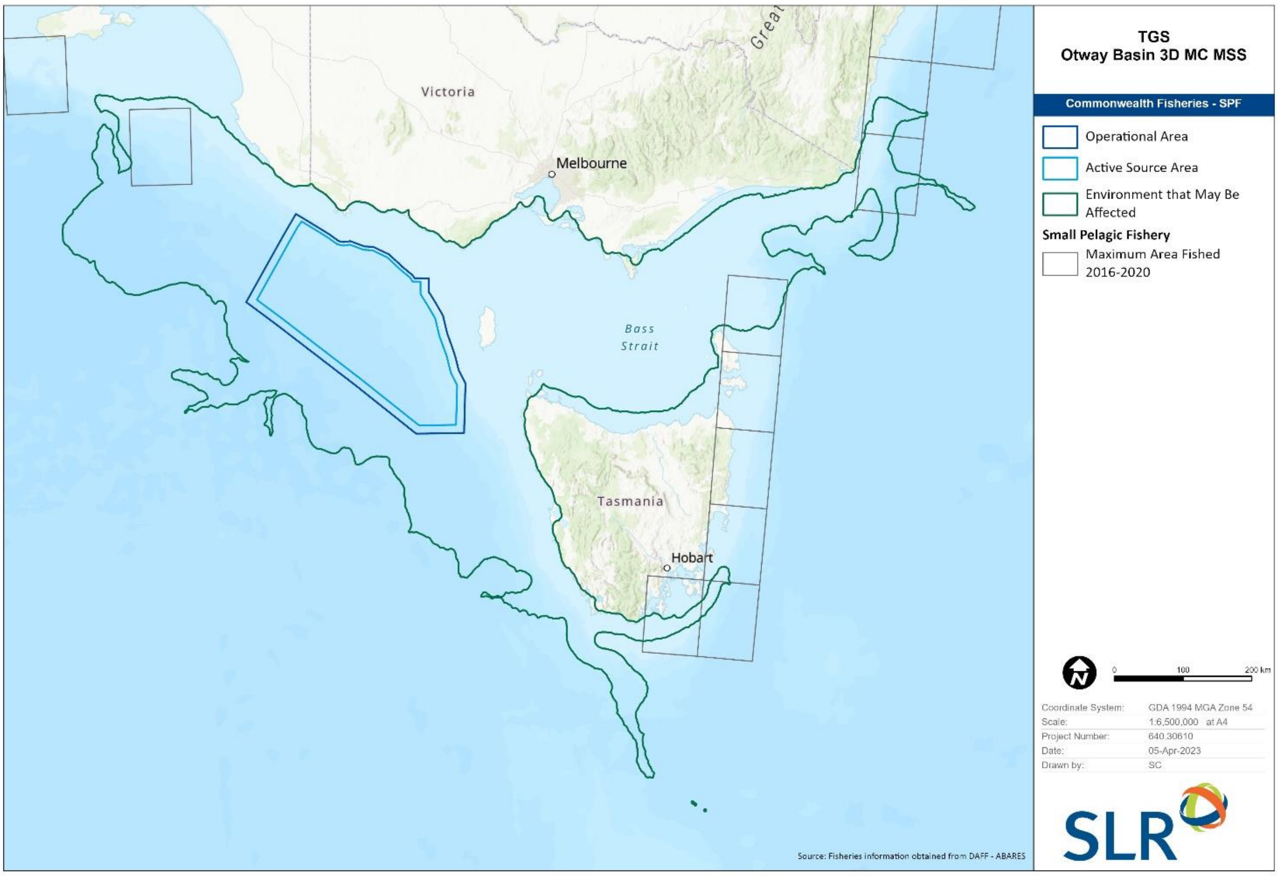


Figure 52 Relative Fishing Intensity in the Small Pelagic Fishery (2016 – 2020)

4.7.3.2.3 Southern Squid Jig Fishery

The SSJF is located off NSW, VIC, TAS and South Australia, and in a small area of oceanic waters off southern QLD. Jig vessels operate at night in depths of 60 – 120 m targeting Gould's squid (Patterson *et al*., 2021). The fishing season for the SSJF runs from 1 January to 31 December.

Historically, fishing intensity has been highest off the coast of Portland, VIC. In 2020, there were 4,800 gear statutory fishing rights, five active vessels, and a total of 1,711 jig-hours. The 2020 total catch was 480t (Patterson *et al*., 2021).

Catch for the 2016 – 2020 fishing seasons was reported off Portland, VIC, and the east coast of TAS. No areas of high fishing intensity overlap with the OA, however, low - high intensity fishing effort has occurred along the northern boundary of the OA and some fishing events (no intensity reported due to confidentiality) have occurred throughout the OA (**Figure 53**). The OA overlaps with approximately 4.9% of the total catch for 2016 – 2020, representing an average annual revenue overlap of $14,920.

It is noted that effort in the SSJF is highly variable due to the fluctuating market value of squid. Prior to 2016, effort occurred off the west coast of TAS in waters adjacent to the SE of the OA.

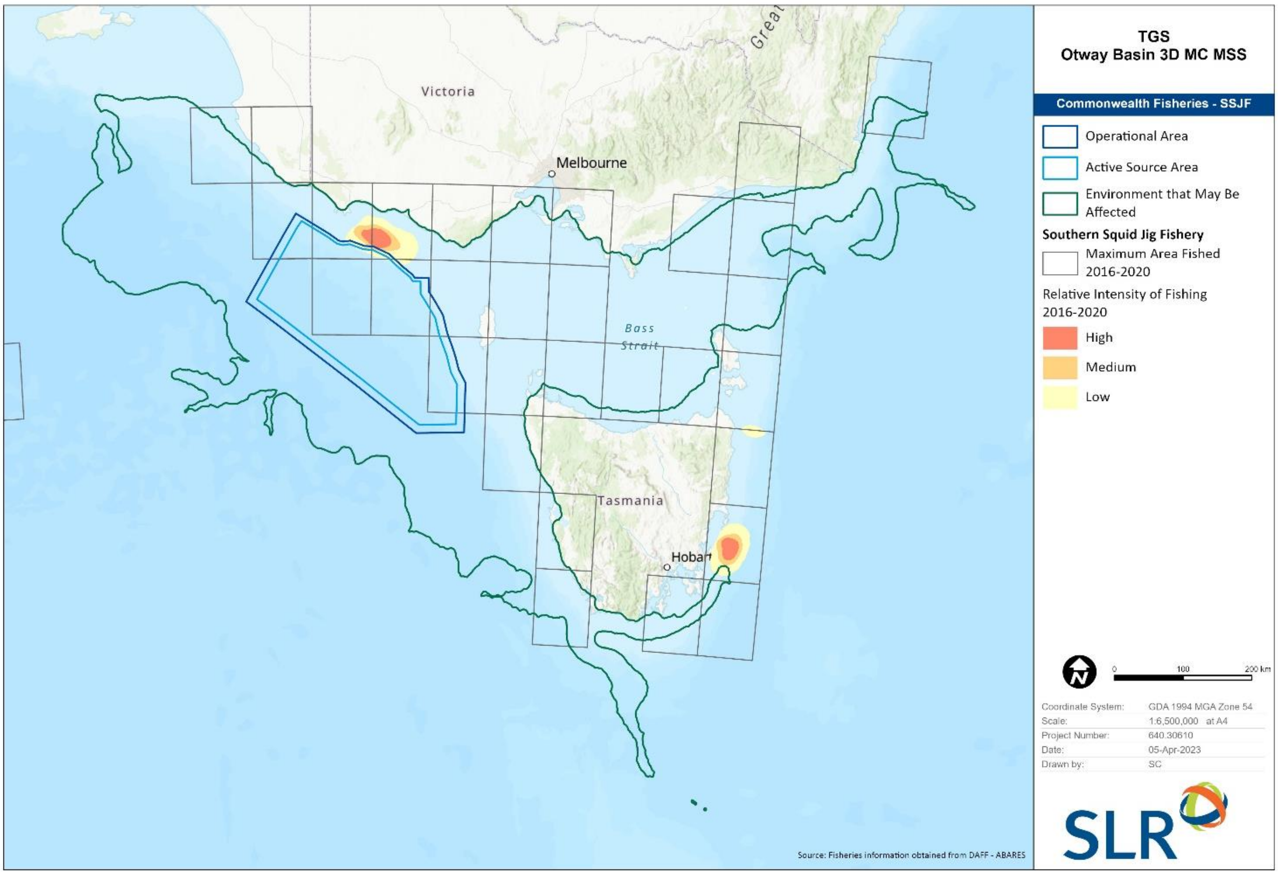


Figure 53 Relative Fishing Intensity in the Southern Squid Jig Fishery (2016 – 2020)

4.7.3.2.4 Eastern Tuna and Billfish Fishery

The Eastern Tuna and Billfish Fishery (**BTBF**) represents one of three tuna fisheries in Australia. This fishery extends from the tip of Cape York, QLD, eastwards around the Eastern Australian coast, terminating at the South Australian/VIC border. The management of the ETBF is influenced by the Western Central Pacific Fisheries Commission (**WCPFC**) to which Australia is a signatory. The WCPFC applies a regional quota, which is subject to an Australian domestic harvest strategy, management arrangements, and setting of annual total allowable catch (Tuna Australia, 2023).

The ETBF is currently accessed through Australian licensed fishing effort. There was also foreign effort through joint venture arrangements with various countries up until 1995. At its peak, there were 230 active vessels in the industry. Currently, there are up to 35 boats actively longlining within areas of the ETBF on any given day during the fishing season, with fishing location changing based on seasonal fish abundance and known events (Tuna Australia, 2023).

Catch rates of yellowfin tuna are indicating a ‘pulse event’ is occurring (high abundance of tuna), driven by eddy formation dynamics, climate influences, prey availability, and other unknown factors (Tuna, Australia, 2023). A sustained pulse event may change the dynamics of individual fishing strategies, for example, some boats may fish while other boats may move to target areas around TAS in April (Tuna Australia, 2023).

There are five quota species in this fishery: bigeye tuna, yellowfin tuna, albacore, swordfish, and striped marlin. Boats operating within the ETBF target southern bluefin tuna from May – October, with some continuing through to December if market conditions allow. This catch is dependent on available quote after the purse seine sector has finished their catching season (Tuna Australia, 2023).

The northern part of the OA overlaps with blocks where five or fewer vessels per year are reported to have fished. The EMBA overlaps with fishing blocks of low to high fishing effort in the northeast along the VIC/NSW border (**Figure 54**).

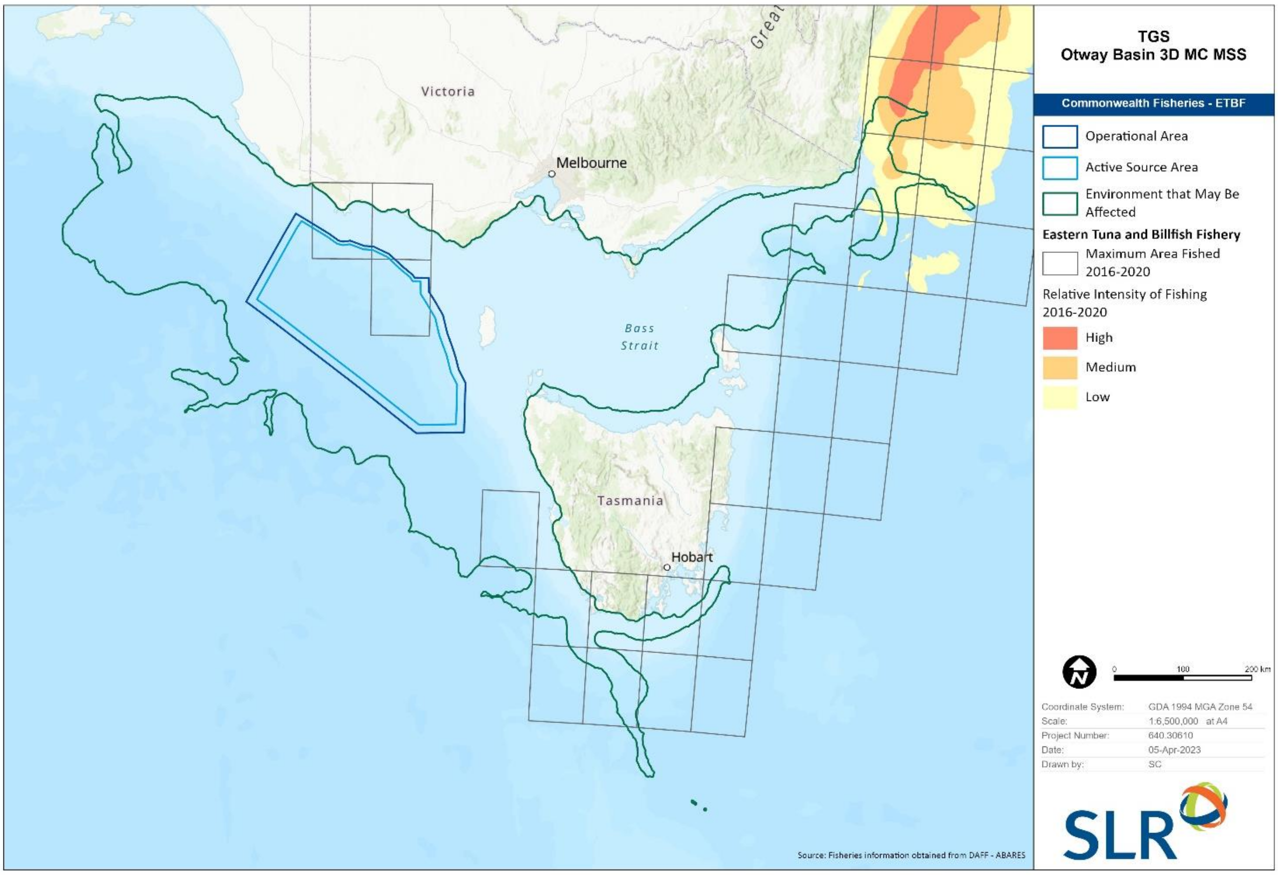


Figure 54 Relative Fishing Intensity in the Eastern Tuna and Billfish Fishery (2016 – 2020)

4.7.3.2.5 Southern Bluefin Tuna Fishery

The SBTF spans the Australian Fishing Zone. Southern bluefin tuna (*Thunnus maccoyii*) is targeted by fishing fleets within the Australia's EEZ. Young fish (1 – 4 years of age) move from the spawning ground in the north-east Indian Ocean into the Australian EEZ and southwards along the Western Australian coast (Patterson *et al*., 2021). The fishing season for the SBTF extends from 1 December to 30 November.

Since 1992, most of the Australian catch has been taken by purse seine, targeting juvenile southern bluefin tuna (2 – 5 years of age) in the GAB, west of the OA. This catch is transferred to aquaculture farming operations off the coast of Port Lincoln in South Australia, where the fish are grown to a larger size to achieve higher market prices. Australian domestic longliners operating along the east coast also catch southern bluefin tuna, and there is some recreational fishing for the species (Patterson *et al*., 2021).

The Australian market is often void of premium quality wild tuna from December to April. As southern bluefin tuna migratory patterns have moved significantly to the east, there is interest in targeting fish across the OA and into Bass Strait from December to April, with fishers then following the tuna to winter grounds (Tuna Australia, 2023).

The number of active purse seine vessels within the SBTF has been stable since 1994, ranging from five to eight vessels. Abundant availability of inshore southern bluefin tuna off the TAS and VIC coastline is driving an increased interest in the minor-line method, reflected in an increase in minor-line Statutory Fishing Right transactions (Tuna Australia, 2023).

During the 2019/20 fishing season, there were seven purse seine and 23 longline vessels active in the SBTF. Total catch for this season was 5,429t over 1,248 search hours and 146 'shots' (Patterson *et al.*, 2021).

Fishing within the SBTF is typically on the outer continental shelf or deeper waters in the GAB or south of Kangaroo Island. High purse seine fishing effort has been reported northwest of the OA within the GAB; these areas overlap with the EMBA, with no overlap reported for the OA (**Figure 55**). Long-lining associated with the SBTF is reported along the NSW coastline. This area of low to high intensity overlaps with the northeast of the EMBA. Fishing blocks of five vessels or less have also been reported throughout the EMBA and overlapping with the OA (**Figure 56**) although due to the low number of vessels utilising these blocks, an estimate of total catch overlap and average annual revenue overlap is not able to be presented.

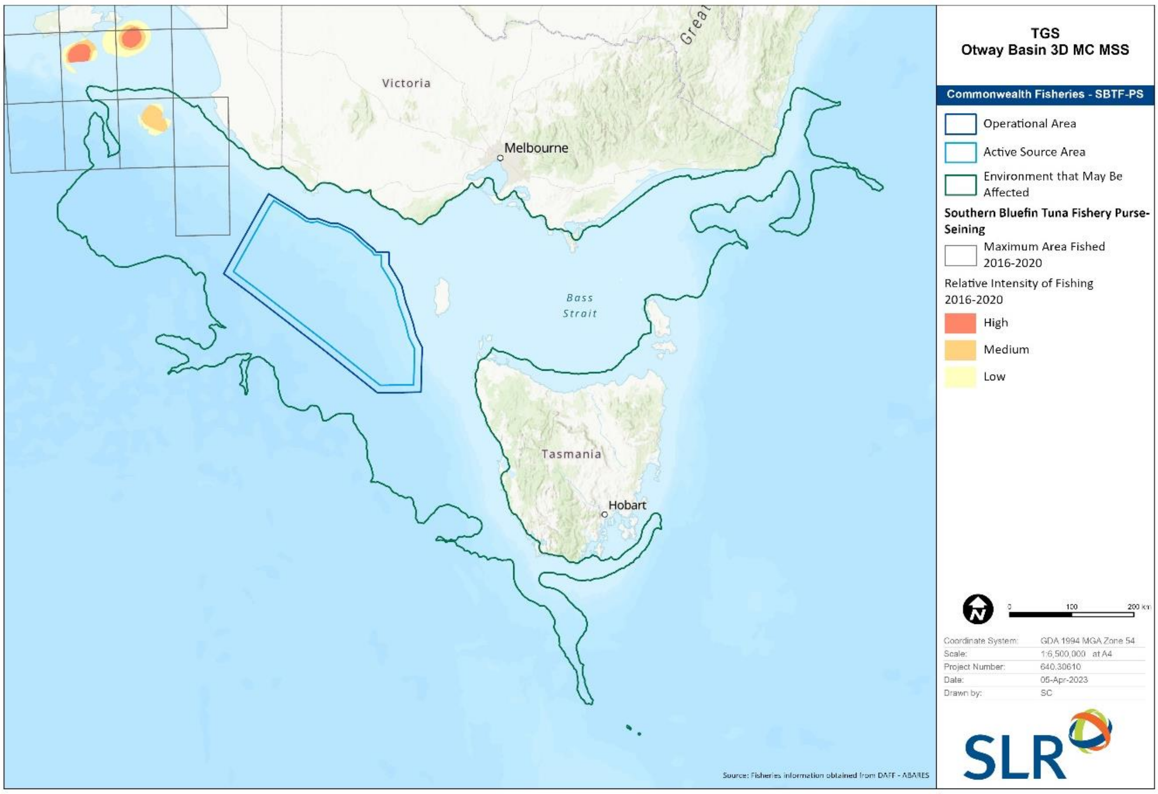


Figure 55 Relative Fishing Intensity in the Southern Bluefin Tuna (Purse-Seining) Fishery

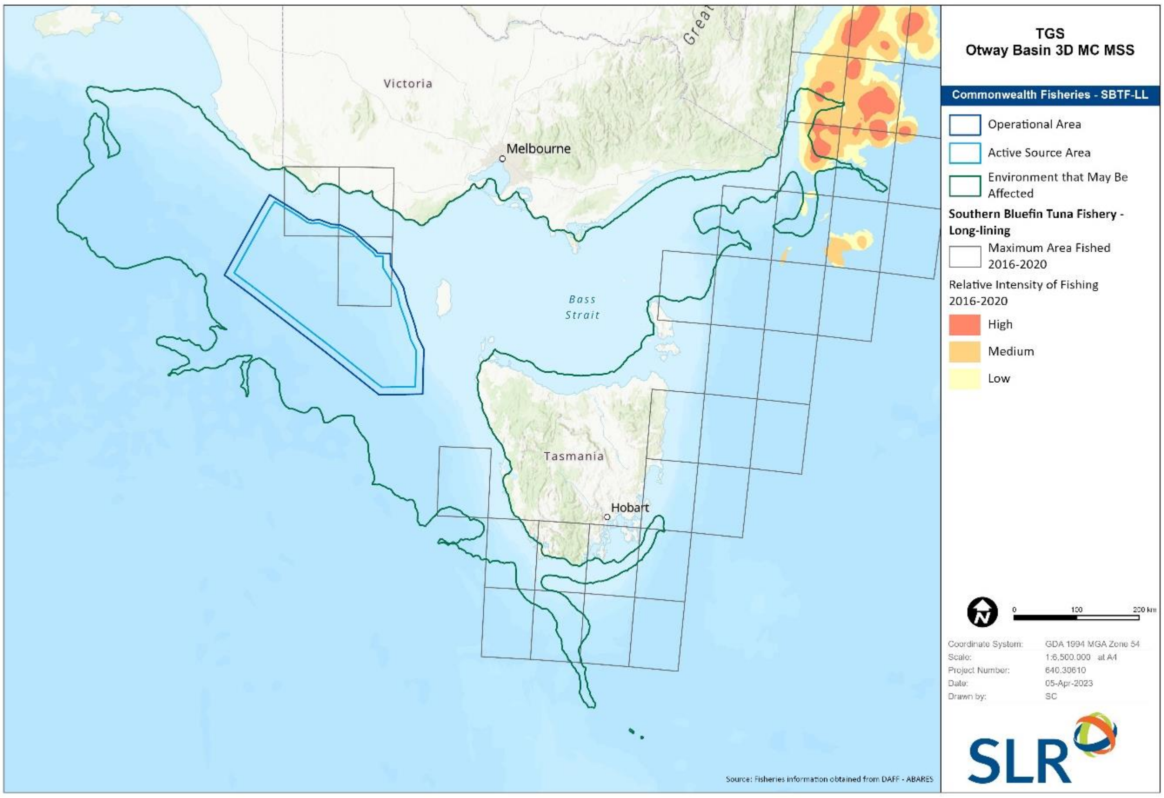


Figure 56 Relative Fishing Intensity in the Southern Bluefin Tuna (Long-Lining) Fishery

4.7.3.2.6 Bass Strait Central Zone Scallop Fishery

The BSCZSF operates in the central area of Bass Strait, between the VIC and TAS scallop fisheries. It is a single species fishery that targets dense aggregations ('beds') of commercial scallop using scallop dredges. In 2021, fishing was permitted throughout the fishery, except over four scallop beds that were closed under the BSCZSF harvest strategy. In 2021, fishing was concentrated over eastern and western Bass Strait beds (Patterson *et al.,* 2021). Fishing effort occurs between July and December.

In 2009, the BSCZSF re-opened following a three-year closure. 26 active vessels fished in this fishery, with this number decreasing to 12 by 2019 and nine in the 2020 fishing season. Total catch in the 2020 fishing season was 2,732t over 4,727 hours of fishing effort (Patterson *et al*., 2021).

The OA overlaps part of a single 60 NM fisheries reporting block to the west of King Island (**Figure 57**) with this block representing where five or fewer vessels per year are reported to have fished. Due the low numbers of vessels reported for this fishing block, an estimate of the percentage of total catch overlap and average annual revenue overlap with the OA cannot be calculated. The wider EMBA overlaps with areas of low to high relative intensity of fishing to the northeast of King Island, and northeast of Flinders Island (**Figure 57**).

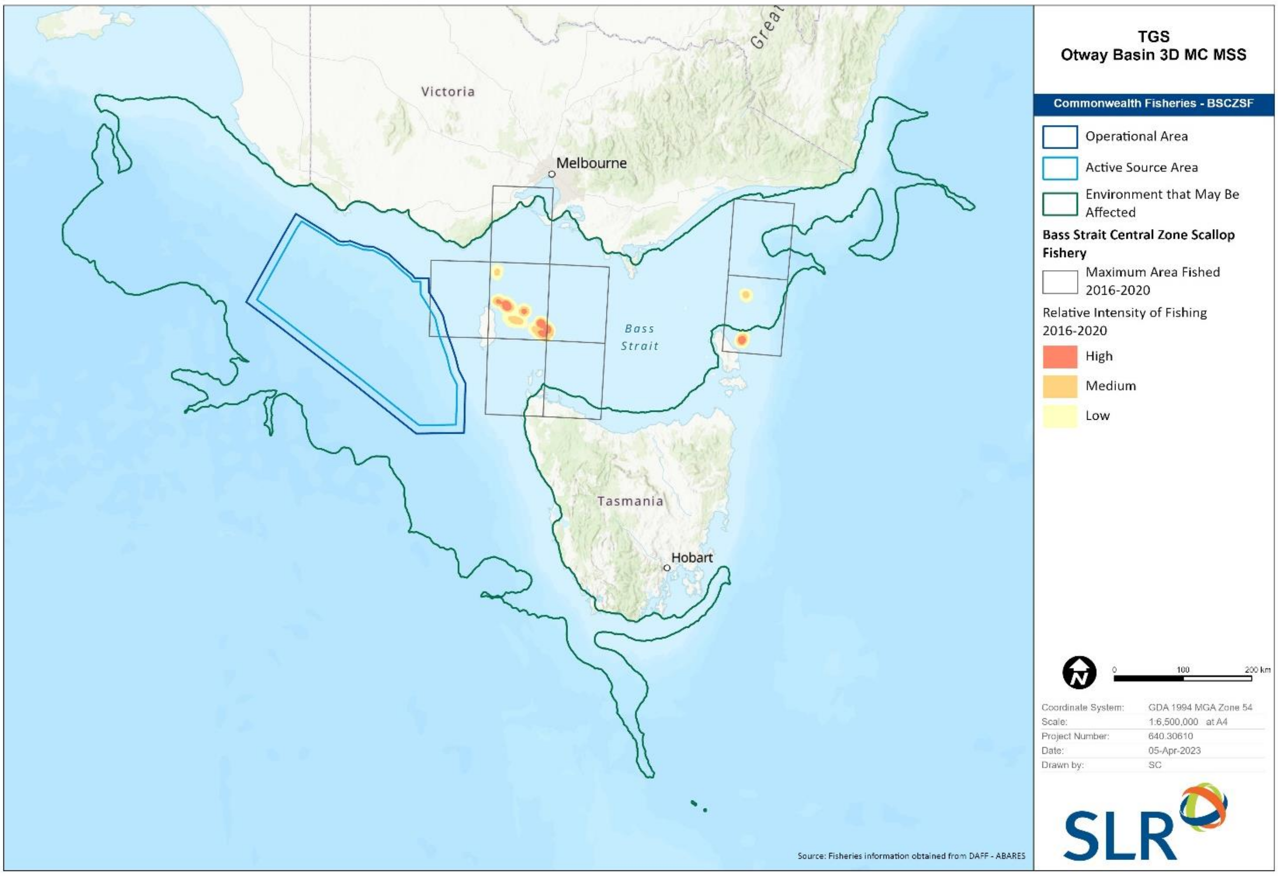


Figure 57 Relative Fishing Intensity in the Bass Strait Central Zone Scallop Fishery (2016 – 2020)

4.7.3.3 Victorian Managed Fisheries

The Victorian Fisheries Authority (**VFA**) is an independent statutory authority that was established to manage VIC fisheries resources. By working with stakeholders, the VFA aims to deliver on three main outcomes: sustainable fishing and aquaculture, clear resource access and sharing arrangements, and increased economic, social and cultural value. The VFA manages commercial fisheries through licencing and quota management, enforcement of the provisions of the Fisheries Act 1995, support of sustainable and responsible fishing and aquaculture, and research and fishery monitoring and assessments (VFA, 2023a).

VIC State-managed fisheries that overlap with the OA and EMBA are discussed in **Section 4.7.3.3.1** – **Section 4.7.3.3.11**.

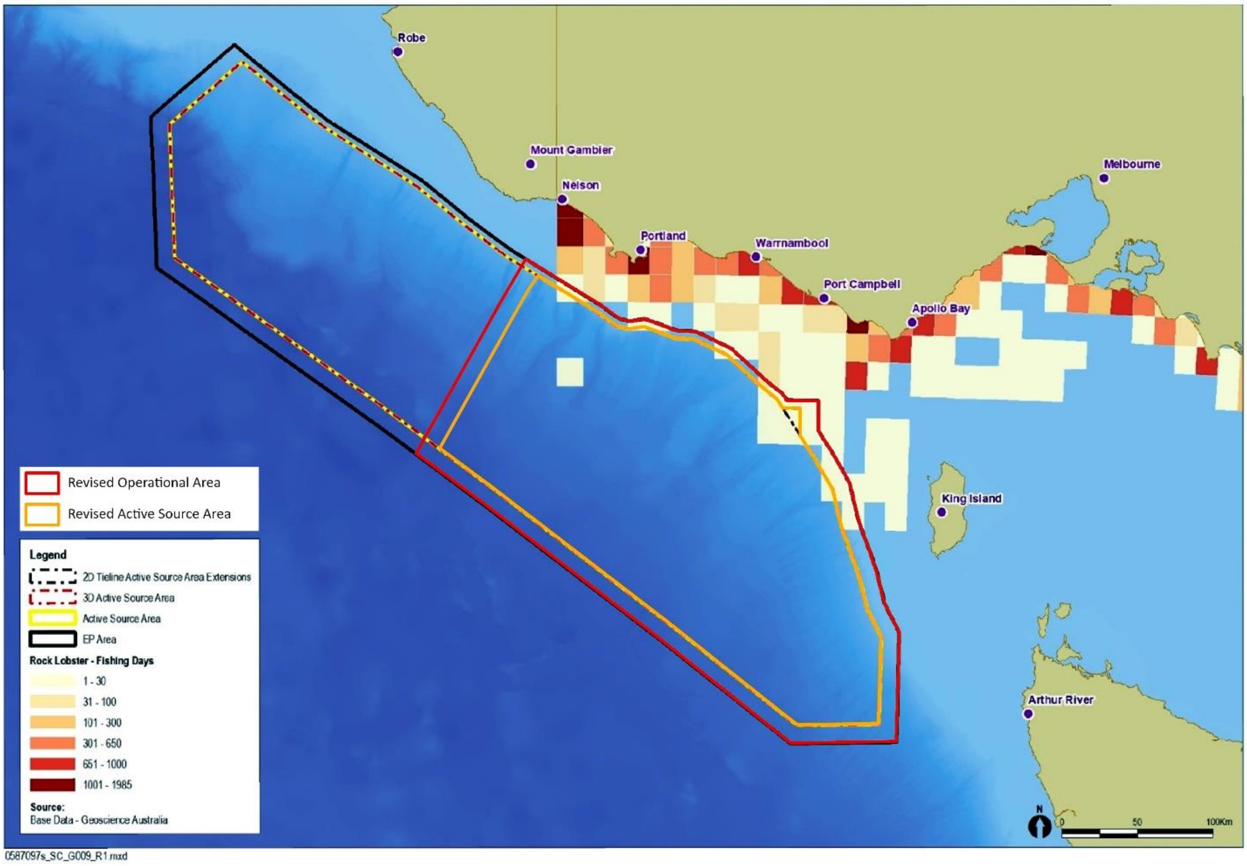
4.7.3.3.1 Rock Lobster Fishery

The rock lobster fishery is VICs most valuable fishery and is based on the southern rock lobster (VFA, 2023b). The fishery extends along the VIC coast, out to Commonwealth waters. It is managed in two separate zones; the Western Zone and Eastern Zone, with separate Total Allowable Commercial Catch set for each zone. The majority of catch in the VIC rock lobster fishery originates from the Western Zone, within which the OA overlaps.

Spawning of rock lobster in Victoria waters occurs from June – November. The rock lobster fishery is closed from 1 June to 15 November for females (to protect berried females during the spawning season) and 15 September to 15 November for males (to protect males during the moulting period). Catch has historically increased from a minimum in September to a peak in December and January, followed by a gradual decrease. Most catch caught from the Western Zone is landed through Portland, Port Fairy, Warrnambool, Port Campbell, and Apollo Bay. Almost all VICs commercial rock lobster catch is usually exported to international markets, predominantly Asia; however, since 2020 there has been a shift of the primary market back to domestic sales (VFA, 2023b).

The rock lobster fishery primarily operates on the continental shelf and is greatest in water depths less than 100 m. It is understood from consultation with rock lobster stakeholders that fishing in the deep waters happens occasionally when targeting 'white fish' to bulk up and order for a large amount of lobster meat where the red lobster appearance (associated with shallow waters) is not needed.

All areas of high fishing intensity (i.e. >100 fishing days) are outside of the OA. A relatively low level (1 – 30 fishing days) of fishing intensity has occurred along the northern boundary of the OA and towards King Island, with one fishing block along the northern boundary experiencing slightly higher fishing intensity (31 – 100 fishing days) (**Figure 58**). A single block also appears to have been fished within the centre of the OA (**Figure 58**); however, given the deep waters (>2,000 m) associated with this block, it is possible that this a logbook entry error. Overall, the OA overlaps with approximately 2% of the total catch, equating to $265,430 average annual revenue overlap.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 58 Fishing Intensity (Fishing Days) in the Victorian Rock Lobster Fishery (2016 – 2020)

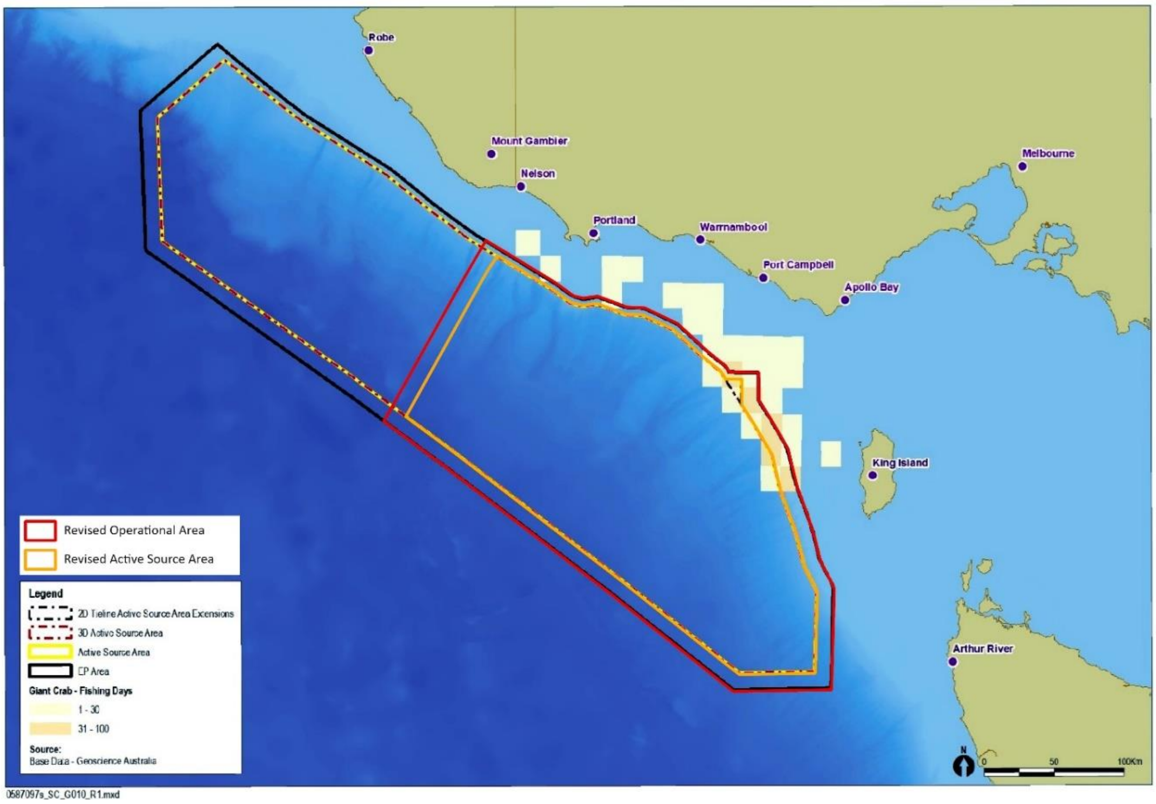
4.7.3.3.2 Giant Crab Fishery

The giant crab fishery is a small, limited entry fishery (maximum 30 licences) that is closely linked to the VIC rock lobster fishery; a Giant Crab Fishery (Western Zone) Access Licence can only be operated when it is joined to a Rock Lobster Fishery (Western Zone) Access Licence. The boundaries of this fishery mimic those of the VIC rock lobster fishery in the Western Zone. Fishers target giant crabs (*Pseudocarcinus gigas*) using baited rock lobster pots (VFA, 2023c).

The fishery is closed for taking female giant crabs from 1 June to 15 November, and from 15 September to 15 November for males. This provides protection to female crabs during the spawning season and prevents the use of pots during the closed season for rock lobster. There is a total year-round ban on the retention of berried females (VFA, 2023c).

Targeted fishing for giant crabs began in the 1990s, with a general decline in catch and associated effort in the fishery since. Since the introduction of quota in 2001, there have been five or less dedicated fishers active in the giant crab fishery, and up to 20 fishers annually reporting giant crab catch as bycatch from the rock lobster fishery. The total landed catch of giant crab in the 2019/20 (1 July 2019 to 30 June 2020) quota season was 9.8t (VFA, 2023c).

Fishing effort typically targets the edge of the continental shelf between western VIC and TAS (VFA, 2023c). However, the greatest fishing effort occurs in five blocks overlapping water depths less than 1,000 m along the north-eastern edge of the OA, overlapped by the 2D tie line (**Figure 59**). Effort in these blocks ranges from 41 to 92 days over the five-year data period (2016 – 2020). The OA overlaps approximately 62% of the total catch overlap with the giant crab fishery, representing $138,159 average annual revenue overlap.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 59 Fishing Intensity (Fishing Days) in the Victorian Giant Crab Fishery (2016 – 2020)

4.7.3.3.3 Octopus Fishery

The VIC octopus fishery is a relatively new fishery (commenced on 1 August 2020) targeting pale octopus (*Octopus pallidus*) in East Gippsland. Maori octopus (*Macroctopus maorum*) and gloomy octopus (*O. tetricus*) may also be taken. The fishery utilises purpose-built un-baited traps which minimises by-catch.

The fishery is a limited entry fishery with only 11 licences issued. Gear restrictions also exist limiting the number of lines of octopus pots and the number of pots attached to each line. Currently licences only allow the harvesting of octopus from the Eastern Octopus Zone, which extends from approximately Seaspray to the VIC/NSW border and out to 20 NM offshore (VFA, 2023d).

The VIC octopus fishery does not overlap with the OA but may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.4 Abalone Fishery

The abalone is one of VICs most valuable commercial fisheries, with most of the catch exported to international markets. The fishery primarily targets blacklip abalone (*Haliotis rubra*), with greenlip abalone (*H. laevegata*) also targeted in lower numbers (VFA, 2023e).

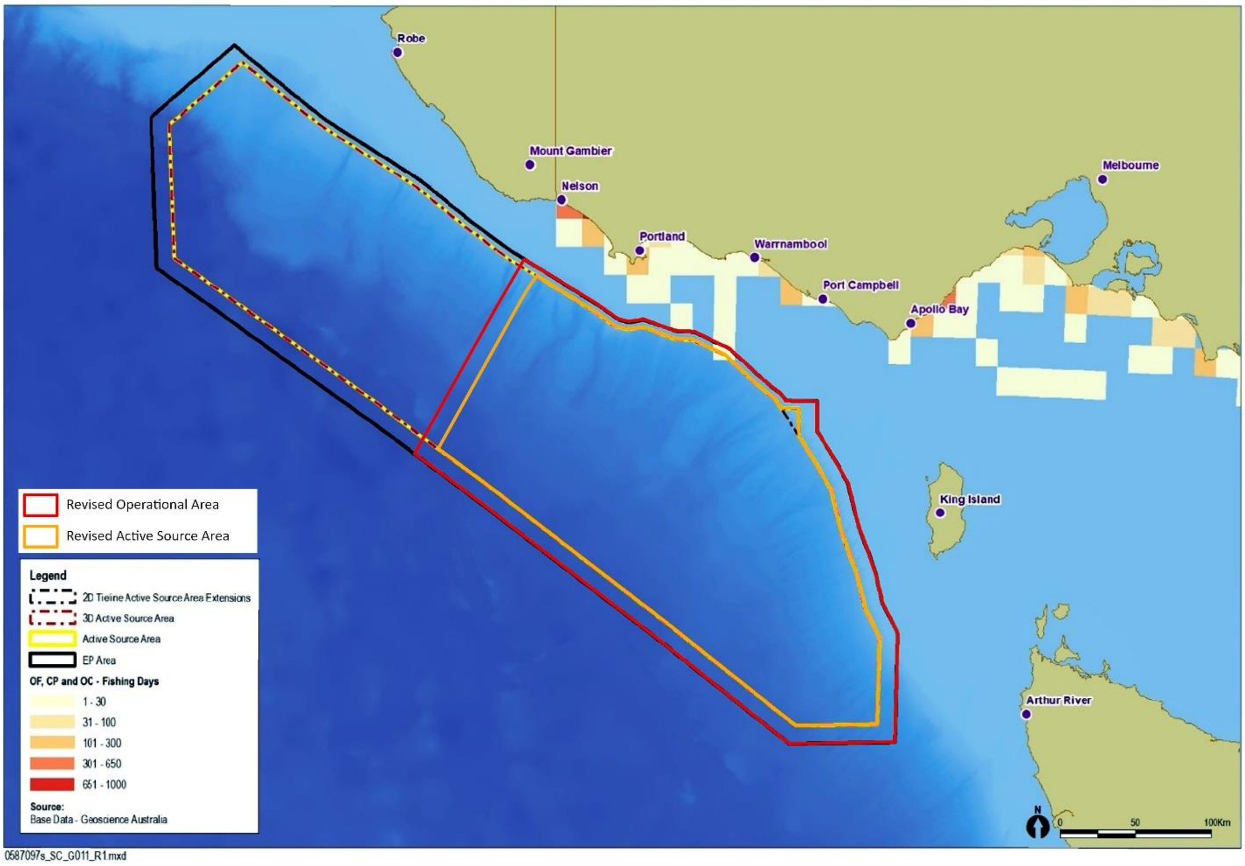
VIC's commercial abalone fishery is subdivided into three management zones: Western Zone, Central Zone, and Eastern Zone. The OA is adjacent to the Western Zone and the western end of the Central Zone. There is a total of 71 Abalone Access Licences within the Victorian fishery: 14 in the Western Zone, 34 in the Central Zone and 23 in the Eastern Zone. This equates to a maximum of 71 divers operating on any particular day across the fishery (VFA, 2023e).

As this fishery is a dive fishery, there will be no overlap with the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.5 Wrasse (Ocean Fishery)

The VIC wrasse (ocean) fishery extends along the entire length of the VIC coastline and out to 20 NM. It was established in the 1990s when a domestic market based on live trade to restaurants and seafood outlets was created. Although the fishery is divided into three commercial management zones (West, Central and East), licence holders can fish in any of these zones. Most fish are harvested by hook and line methods. Target species include bluethroat wrasse and purple wrasse (90% of the commercial harvest), rosy wrasse, senator wrasse, and southern maori wrasse (VFA, 2023f).

As shown in **Figure 60**, the OA overlaps with a single fishing block. This relates to a single day reported in 2020 by one fisher in the Ocean Fishery.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 60 Fishing Intensity (Fishing Days) in the Victorian Ocean Fish, Commercial Permit, and Octopus Fishery Fisheries (2016 – 2020)

4.7.3.3.6 Scallop (Ocean) Fishery

The VIC scallop fishery extends out to the 20 NM limit from the high tide water mark, but excludes the bays and inlets along the coast where commercial scalloping is prohibited. The scallop species *Pecten fumatus* is mostly targeted, although incidental catches or doughboy scallops (*Chlamys asperrimus*) are taken as by-product (VFA, 2023g).

Historically, the majority of the fishing activity in the VIC zone has occurred in the eastern waters of VIC, with most vessels launching from the ports of Lakes Entrance and Welshpool. Following anecdotal reports of high abundances of commercial-sized scallops off the Tarwine oil and gas field, scallop abundance surveys were conducted which identified several scallop beds, seeing the return of a viable scallop fishery in VIC and positive signs of recruitment elsewhere in the fishery (VFA, 2023g).

The number of licences available within the VIC scallop fishery has been capped at 91, and approximately 10 – 15 boats operate in the fishery (VFA, 2023g).

4.7.3.3.7 Scallop Dive (Port Phillip Bay) Fishery

The Scallop Dive (Port Phillip Bay) Fishery was established in 2013 and targets the commercial scallop and doughboy scallop. The fishery is managed by a single commercial access licence, and harvesting is restricted to hand harvesting only (VFA, 2023h).

There is no overlap between the Scallop Dive (Port Phillip Bay) Fishery and the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.8 PQ Aquatics Fishery

PQ Aquatics Syngnathids Wildlife Trade Operation operates in the VIC coastal waters of Western Port Bay and primarily Port Phillip Bay. PQ Aquatics Syngnathids Wildlife Trade Operation harvests various species of syngnathids (seahorses, pipefish and seadragons), with the specific species able to be harvested controlled under permit conditions prescribed by the VFA. Specifically, weedy seadragon (*Phyllopteryx taeniolatus*), short-headed seahorse (*Hippocampus breviceps*) and pot-bellied seahorse (*H. abdominalis*) are collected by hand for sale in the aquarium trade (DAWE, 2021).

There is no overlap between the PQ Aquatics Fishery and the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.9 Sea Urchin Fishery

Following the introduction of regulatory arrangements on 1 August 2014, sea urchins can be harvested in eastern VIC and Port Phillip Bay under a Sea Urchin Fisheries Access Licence. The fishery utilises divers to harvest white sea urchin (*Heliocidaris erythrogramma*) and black long-spined sea urchin (*Centrostephanus rodgersii*) (VFA, 2023i).

As this fishery is diver-based, it does not overlap with the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.10 Pipi Fishery

The VIC Pipi Fishery has been managed under a quota management regime since regulations came into force in February 2020, with the new fishery commencing on 1 April 2020. Although the fishery covers the entire VIC coastline, Pipi Fishery Access Licences have only been issued for the Discovery Bay and Venus Bay commercial management zones (VFA, 2023j). The fishery targets the pipi (*Donax deltoides*) which inhabit the surf zone of high-energy sandy beaches. No other species can be retained. Pipi are collected using dip nets (VFA, 2018).

The Pipi Fishery does not overlap with the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.3.11 Corner Inlet Fishery

The Corner Inlet (Nooramunga) Fishery is one of VIC's most important fisheries. It is a significant supplied of local seafood and supports local employment in southern Gippsland. The fishery is located in South Gippsland and includes all marine waters inshore of the five main entrances from Bass Strait: Port Welshpool entrance, Port Albert entrance, Kate Kearney entrance, Shoal/Shallow Inlet entrance, and McLoughlin's Beach entrance (VFA, 2022).

The fishery is a multi-species fishery, with more than 20 species caught on a regular basis. The 12 most important species in the fishery are: King George whiting, southern sea garfish, southern calamari, rock flathead, gummy shark, southern bluespotted flathead, southern sand flathead, greenback flounder, silver trevally, Australian salmon, snapper, and yellow-eye mullet (VFA, 2022).

There are 18 transferrable Corner Inlet Fishery Access Licences which are mostly all currently active, however, some are operated on a part-time basis. Fish are predominantly taken via seine nets and mesh nets, although longline and other fishing gear (including hoop nets and hand lines) are also authorised under this licence class and are occasionally used (VFA, 2022).

The Corner Inlet Fishery does not overlap with the OA, although the fishery may overlap with the EMBA. No estimation of total catch overlap and average annual revenue overlap has been provided.

4.7.3.4 Tasmanian Managed Fisheries

Commercial fisheries within TAS waters are managed by the Tasmanian Government Department of Natural Resources and Environment Tasmania (**DNRET**). DNRET is responsible for the sustainable management of the State’s natural and cultural heritage and the integrity of the racing industry for the benefit of the TAS community (DNRET, 2023).

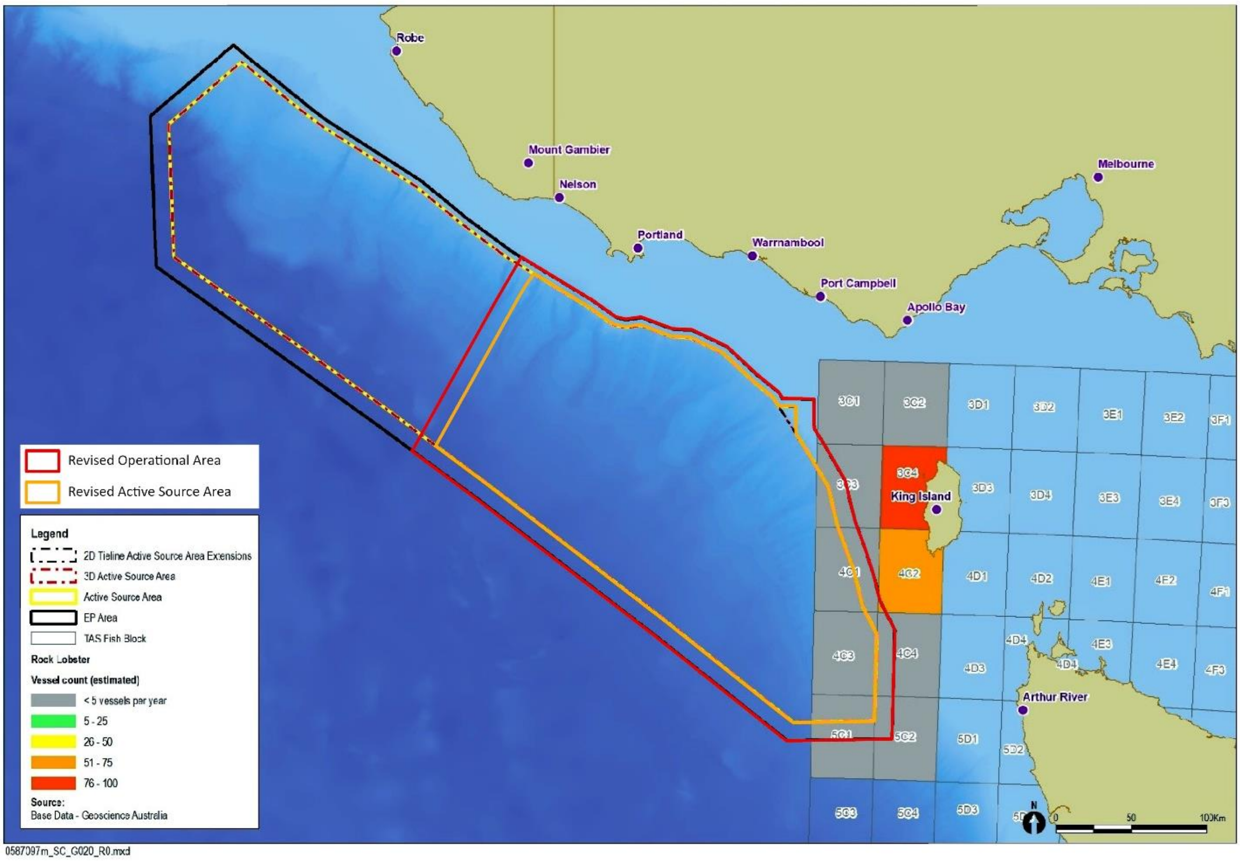
TAS State-managed fisheries that overlap with the OA and EMBA are discussed in **Section 4.7.3.4.1** – **Section 4.7.3.4.9**.

4.7.3.4.1 Rock Lobster Fishery

The rock lobster fishery is a major Tasmanian industry providing significant benefits from exports from the commercial fishery and is also highly valued by recreational and Aboriginal fishers. The fishery primarily targets southern rock lobster (*Jasus edwardsii*), with small amounts (less than 1% of the fishery) of eastern rock lobster (*J. verreauxi*) also taken. Giant crab and octopus are bycatch associated with this fishery. Commercial fishers use baited pots to harvest lobsters. Most of the catch comes from the western half of TAS, although the east coast is also fished and is particularly important for the recreational fishery (Fishing TAS, 2023a).

The TAS rock lobster fishery is subject to a fisheries closure period, whereby the fishery outside of the East Coast Stock Rebuilding Zone is open from 15 November to 1 May for females in all State waters. For males the fishery is open from 15 November to 1 September in all waters south of St Helens Point around to Sandy Cape (41°29’) and to 1 October for all other State waters.

Fishing effort near the OA is greatest in the shallow waters surrounding King Island. In all other blocks where fishing was reported, including those overlapped by the OA, fishing was undertaken by less than five vessels per year (**Figure 61**). The OA overlaps with approximately 0.14% of total catch, equating to $77,650 average annual overlap. Fishing effort associated with the TAS rock lobster fishery is expected to be concentrated inshore of the OA, with some limited effort in deeper water along the margin of the OA.



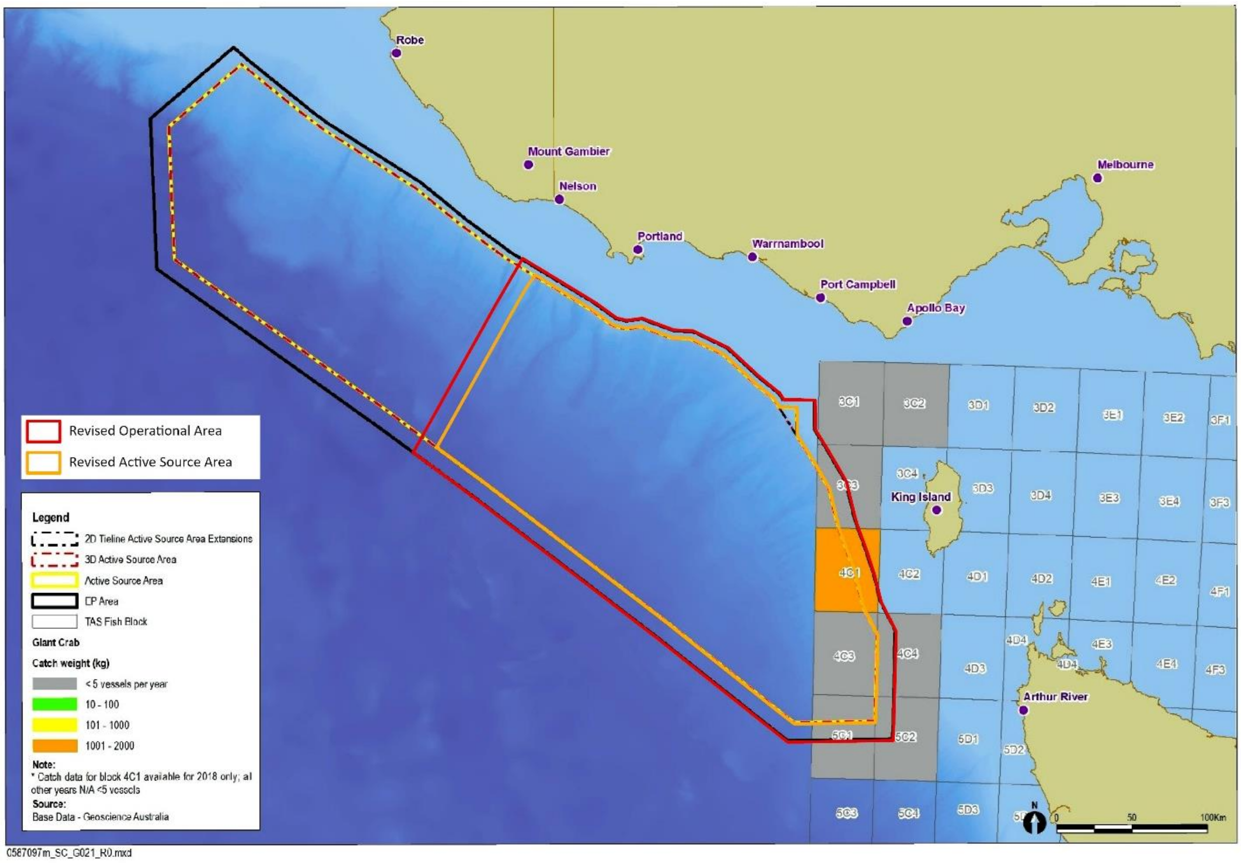
Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 61 Fishing Intensity (Estimated Vessel Count) in the Tasmanian Rock Lobster Fishery (2016 – 2020)

4.7.3.4.2 Giant Crab Fishery

The TAS giant crab fishery is a comparatively small fishery. Although the annual harvest is low (20.7t), it has a high landed value of approximately $2 million. The commercial fishery has existed since the early 1990s and has since moved from open access to a limited entry fishery managed by individual transferrable quotas (Fishing TAS, 2023b). The fishery is closed from 15 November to 31 May for females, but open year-round for males.

Fishing effort reported between 2016 and 2020 shows effort has taken place in blocks both on the continental shelf and the continental slope, with fishing in most blocks undertaken by less than five vessels per year. Only in 2018 was a single block targeted by more than five vessels, suggesting this block may receive most effort than others. This area overlaps with the boundary of the OA (**Figure 62**). Based on the mapped giant crab fishing effort, fishing within this fishery primarily takes place in water depths <400 m. Limited fishing effort is understood to occur in deeper waters within the OA, however consultation with TAS giant crab fishers indicated that fishing does sometimes occur at greater depths.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 62 Fishing Intensity (Estimated Vessel Count) in the Tasmanian Giant Crab Fishery (2016 – 2020)

4.7.3.4.3 Scalefish Fishery

The commercial scalefish fishery is a multi-species and multi-gear fishery predominantly made up of small owner operators. Vessels vary in size and type and a range of different fishing methods are used (e.g. gillnets, hook and line, longline, drop line, squid jig, etc.). Commonly targeted species include banded morwong, southern calamari, octopus, tiger flathead, school whiting, southern garfish, wrasse, Gould's squid, bastard trumpeter, blue warehou, silver warehou, flounder, silver trevally, striped trumpeter, and small pelagics (Fishing TAS, 2023c), with the highest catches in 2020/21 reported for Gould's squid, southern calamari, tiger flathead, and eastern school whiting.

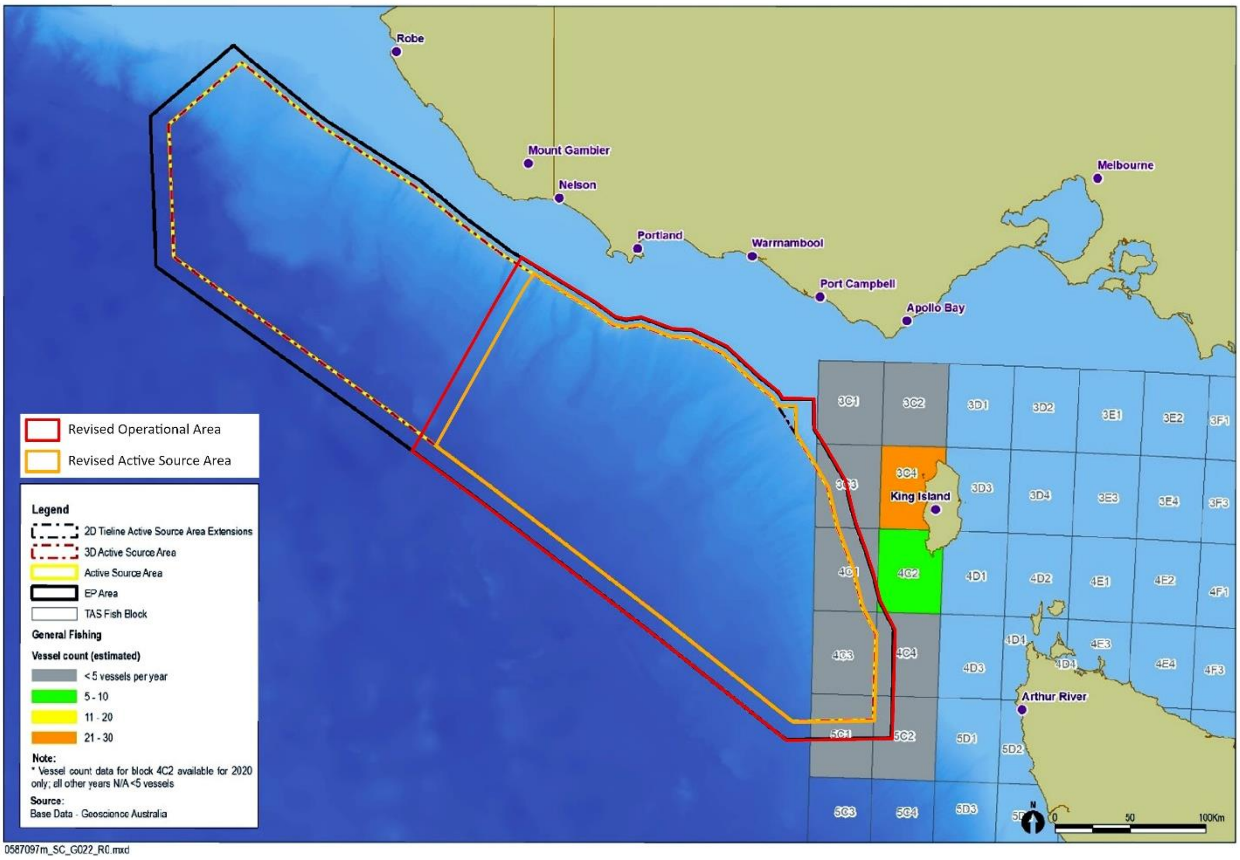
The TAS scalefish fishery is open year-round, except for during the following species-specific seasonal closures:

- Banded morwong – Closed from 1 March to 30 April;
- Southern calamari – Closed from 1 October – 31 October (north coast) and 15 October – 14 November (east coast);
- Garfish – Closed from 15 November – 14 December (south) and 15 January – 14 February (north); and
- Striped trumpeter – Closed from 1 September – 31 October.

The TAS scalefish fishery is managed through capped licence numbers, closed seasons, gear restrictions, size limits, and trip limits. There are a variety of types of licences that allow access to a specific species and the use of specific gear to take that species. These include ten gear type licences, three species licences, and three other licences.

Since the early 1990s, annual commercial catch for the major scalefish species has generally declined, with this decline explained in part by changed targeting practices and market demand, declines in species abundance and biomass, the introduction of the Scalefish Fishery Management Plan in 1998, and the transfer for the Southern Shark Fishery to the Commonwealth in 2000 (Fraser *et al*., 2022). In 2019/20, total catch was 293t. The total number of licences in 2022 was 344 gear-type licences, 113 species licences, and 1,440 other licences, however, only 20 – 50% of licences are active depending on the type (Fraser *et al*., 2021).

Fishing effort near the OA from 2016 – 2020 was focused on the waters surrounding Kind Island, with fishing in all other blocks undertaken by less than five vessels per year. The OA overlaps with low fishing intensity blocks along the eastern boundary, with a small overlap with fishing block 4G2 within which 5 – 10 vessels were reported to have fished (**Figure 63**). The OA overlaps approximately 0.2% of the total catch, equating to $38,670 average annual revenue overlap.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 63 Fishing Intensity (Estimated Vessel Count) in the Tasmanian Scalefish Fishery (2016 – 2020)

4.7.3.4.4 Abalone Fishery

The TAS abalone fishery is the largest wild abalone fishery in the world, providing approximately 25% of the annual global production of wild caught abalone. The fishery mainly targets blacklip abalone, with greenlip abalone accounting for 5% of the total wild harvest. Commercial abalone divers harvest the abalone by hand (DPIPWE, 2018).

The TAS abalone fishery is open year-round, however, at times, sub-blocks of the commercial abalone fishery are closed to control the total amount of abalone harvested in an area in the interest of resource sustainability; these are referred to as 'catch-ups'. The commercial fishery has limited entry via a cap on dive licences and is managed using a system of size limits, total allowable catch, and regional catch-ups. Catch-ups are set for the following quota year, which aligns with the calendar year (DPIPWE, 2018). Annual catch within the TAS abalone fishery has continued a downward trend since approximately 2010 (Mundy and McAllister, 2022).

There is no overlap between the OA and the TAS Abalone Fishery, although the fishery may overlap with the EMBA.

4.7.3.4.5 Commercial Dive Fishery

The TAS commercial dive fishery selectively harvests three key species by hand from small vessels: shortspined sea urchin (*Heliocidaris erythrogramma*), wavy periwinkle (*Lunella undulata*) and longspined sea urchin (*Centrostephanus rodgersii*). The fishery is predominantly owner-operated, with around 53 licences (Fishing TAS, 2023d).

As the two urchin species spawn at different times of the year, the urchin fishery operates almost year-round. Harvesting of shortspined urchin peaks from August to January, longspined sea urchin from December to July, and wavy periwinkle from August to November (Fishing TAS, 2023d).

There is no overlap between the OA and the TAS commercial dive fishery, although the fishery may overlap with the EMBA.

4.7.3.4.6 Marine Plants Fishery (formerly Kelp Fishery)

The marine plants fishery covers the harvest of marine plants including kelp, seaweed, seagrasses and algae. No marine plants may be harvested directly from the water, expect in the Undaria fishery. The fishery is therefore comprised of a commercial beach-cast harvest, and a commercial diving harvest for Undaria. For the commercial beach-cast harvest, licensed harvesters hand-collect beach-cast seaweed. Bull kelp (*Durvillaea potatorum*) is the main harvest species, primarily from King Island, Marrawah, and Grainville Harbour. Licensed commercial divers hand collect Undaria from East Coast waters under the authority of a fishing licence.

There is no overlap between the OA and the TAS marine plants fishery, although the fishery may overlap with the EMBA.

4.7.3.4.7 Octopus Fishery

The Tasmanian octopus fishery operates off the north coast of TAS and in the Bass Strait. The fishery primarily targets pale octopus with maori octopus and gloomy octopus caught as by-catch. The fishery has been a sole operator fishery since its commencement in 1980, with two vessels operating in the fishery. Unbaited octopus pots are deployed at fishing grounds, with retrieval occurring approximately 3 – 6 weeks later (Krueck *et al.,* 2021).

Commercial fishing for octopus is currently restricted to the East Bass Strait and West Bass Strait fishing zones, with the remainder of TAS waters classified as developmental and may be opened to fishing. In 2019/20, almost all of the octopus catch in the fishery was taken from within two fishing blocks east of King Island; however, historically productive fishery areas include north-east of Flinders Island (Krueck *et al.,* 2021). It is unlikely that this fishery overlaps with the EMBA based on recent fishing effort. There is no overlap between the OA and the TAS octopus fishery.

4.7.3.4.8 Scallop Fishery

The TAS scallop fishery extends to 200 NM from the TAS coast, except for Bass Strait, where its jurisdiction covers 3 – 20 NM offshore. As of 31 December 2022, the TAS scallop fishery is closed. Statewide exploratory commercial scallop surveys will commence from 1 April 2023, the aim of which are to identify beds of scallops that might be considered for opening during the 2023 season or a future season (Fishing TAS, 2023e).

There is no overlap between the OA and the TAS scallop fishery and it is unlikely that this fishery overlaps with the EMBA.

4.7.3.4.9 Shellfish Fishery

The TAS commercial shellfish fishery selectively hand-harvests (e.g diving from small vessels or wading) four species of shellfish: pacific oysters (statewide), native oyster (Georges Bay), Venerupis clams (Georges Bay North Clam Zone), and Katelysia cockles (Ansons Bay Cockle Zone).

Harvest locations are restricted to areas that were historically identified through a research and permitting process, as being best able to support a fishery. There is no overlap between the OA and the TAS shellfish fishery, and it is unlikely that this fishery overlaps with the EMBA.

4.7.3.5 South Australian Managed Fisheries

Commercial fisheries within South Australian State waters are regulated by the Fisheries and Aquaculture division of the Department of Primary Industries and Regions, South Australia (**PIRSA**). The purpose of PIRSA is to grow primary industries and drive regional development. Management of South Australian fisheries are achieved through the administration of the Fisheries Management Act 2007, the management of licences and registrations, preparation of fisheries management plans (thought collaboration with industry and other stakeholders), and support of scientific research and innovation through the South Australian Research and Development Institute (**SARDI**) (PIRSA, 2023).

SARDI is the South Australian Government's principal primary industries research institute, providing policy-driven applied research. Research carried out by SARDI has supported PIRSA's fisheries management decisions for ongoing ecological sustainability of South Australian commercial fisheries and has resulted in higher economic returns (SARDI, 2017).

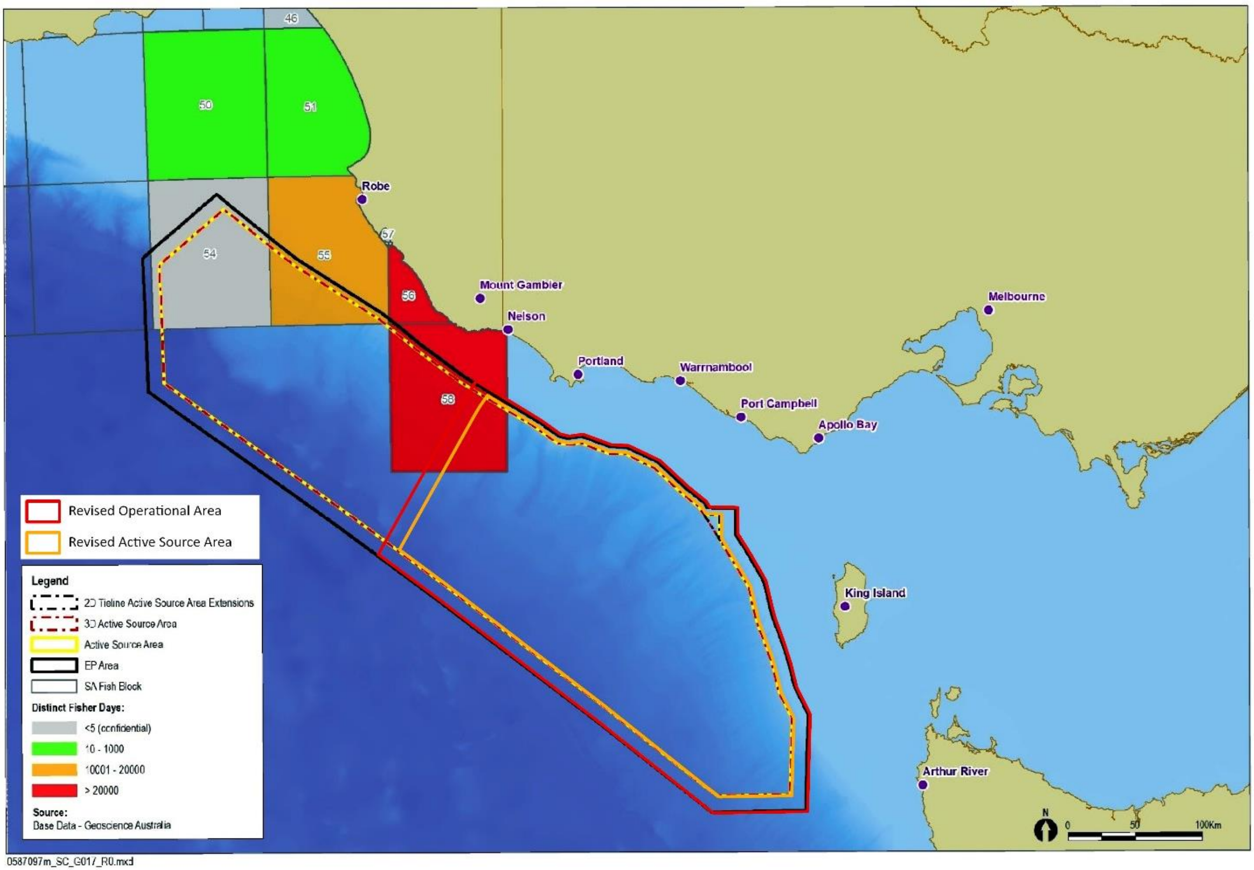
South Australia State-managed fisheries that overlap with the OA and EMBA are discussed in **Section 4.7.3.5.1 – Section 4.7.3.5.6**.

4.7.3.5.1 Rock Lobster Fishery

The South Australian rock lobster fishery is separated into two management zones: the Southern Zone (all marine waters between the mouth of the Murray River and the VIC border, and the Northern Zone (all marine waters between the mouth of the Murray River and the Western Australia border. The OA primarily overlaps the Southern Zone of the fishery, with negligible overlap with the boundary of the Northern Zone in offshore waters. There are 180 commercial licences within the Southern Zone, with lobsters caught using steel-framed pots that are set overnight and retrieved at first light. The fishery within the Southern Zone is closed from 1 August to 14 September. The fishery targets southern rock lobster, with giant crab and octopus also permitted to be landed and sold (Linnane *et al*., 2022).

In 2020, the total commercial catch within the Southern Zone was 1,289t, with an effort of 775,014 potlifts (Linnane *et al*., 2022).

Fishing effort data is available in coarse resolution (60 NM) blocks only. In the five year period between 2016 and 2020, the greatest effort was undertaken in blocks 56 and 58, with over 20,000 distinct fisher days reported in these blocks. The OA overlaps with block 58. A slightly lower level of effort was reported in block 55 (10,001 – 20,000 days) (**Figure 64**). The pattern of fishing effort (**Figure 64**) suggests that waters offshore from Robe to the South Australian/VIC border are the most fished in the Southern Zone. Given the very coarse grid resolution and the preferred water depths of lobsters (up to 200 m (PIRSA, 2021)), it is expected that fishing effort takes place primarily along the northern edge of the OA and in waters further inshore. Some fishing for deeper water lobster mya occasionally occur in the OA.



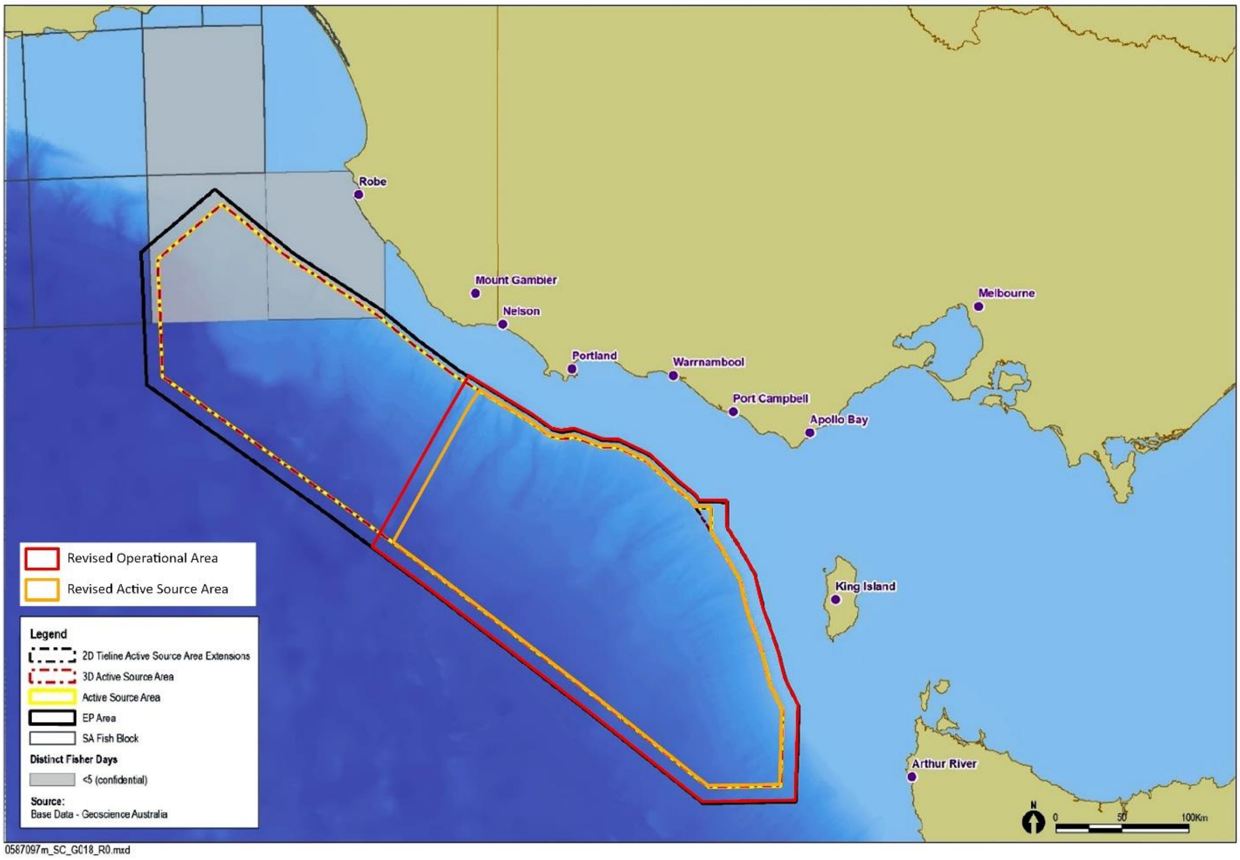
Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 64 Fishing Intensity (Distinct Fisher Days) in the South Australian Rock Lobster Fishery (2016 – 2020)

4.7.3.5.2 Giant Crab Fishery

South Australia's giant crab fishery is linked to the rock lobster fishery. Deepwater traps are used like those used in the rock lobster fisher. The South Australian Southern Zone giant crab fishing season runs between 1 October and 30 April. Females with external eggs cannot be kept and must be returned to the water as soon as possible.

Between 2016 and 2020, there was no fishing effort reported for the giant crab fishery within the OA, with all fishing effort ocurring at low levels offshore from Robe and towards Kangaroo Island (**Figure 65**). Given that giant crab occur at depths ranging from 20 to 600 mm with the highest population densities found at the edge of the continental shelf at depth of 140 – 270 m, the greatest effort is expected to occur outside of the OA.



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

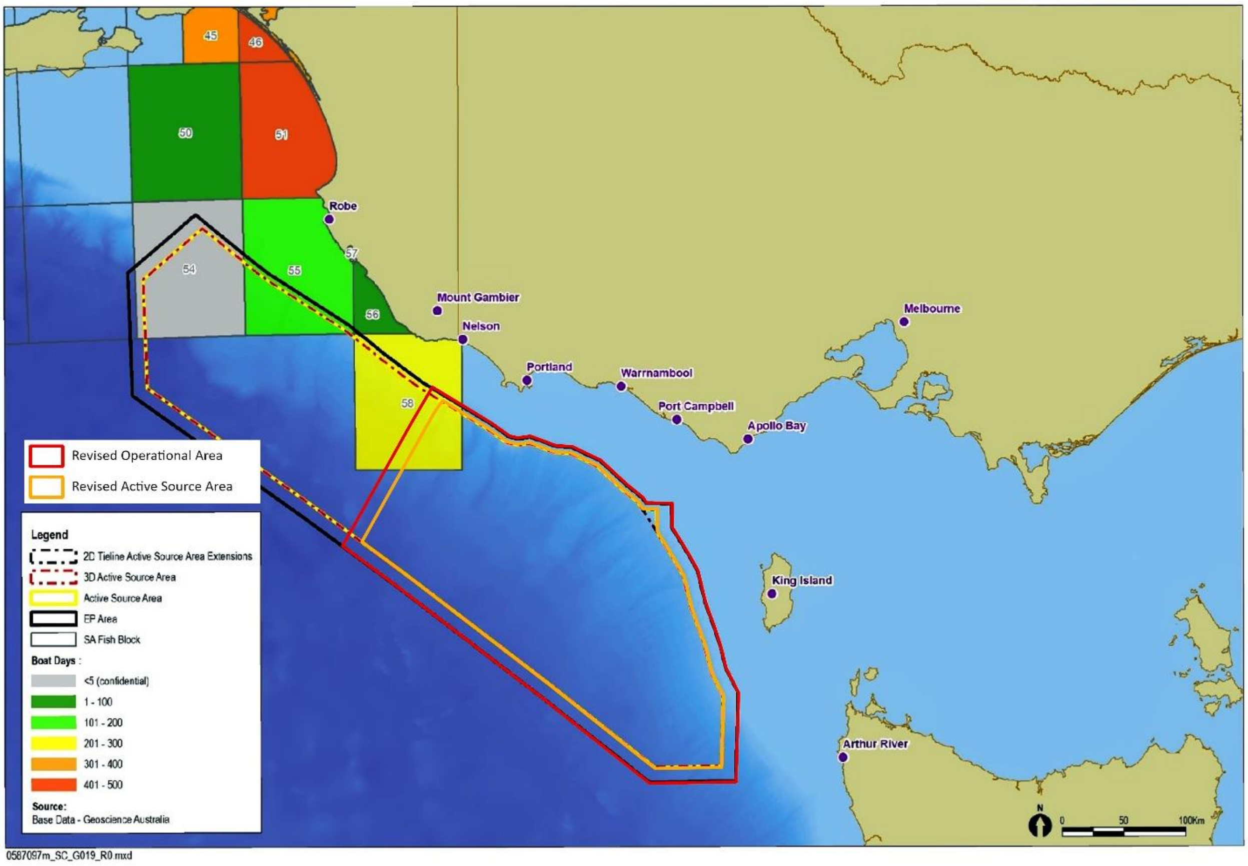
Figure 65 Fishing Intensity (Distinct Fisher Days) in the South Australian Giant Crab Fishery (2016 – 2020)

4.7.3.5.3 Marine Scalefish Fishery

The South Australian marine scalefish fishery covers all coastal waters of South Australia between the Western Australia and VIC borders. It is a multi-species and multi-gear (hook and line, longline, haul nets, mesh nets, and jigs) fishery that covers more than 60 species of scalefish. Fishign within this industry occurs year-round. The main species taken within this fishery are King George whiting, southern garfish, and southern calamari, with these four species making up 60% of the total fishery production weight and 70% of the total fishery value (PIRSA, 2023a). In 2020, there were more than 300 active licence holders within the fishery (Smart *et al.*, 2022).

Major changes to the fishery were implemented on 1 July 2021 with the goal of strengthening the long-term financial and ecological sustainability of the industry. Key elements of the reform include the establishment of four fishing zones (West Coast, Spencer Gulf, Gulf St Vincent and Kangaroo Island, and South East), the establishment of individual transferrable quota to manage catch limits, and separation of the commercial taking of vongole and sardine from the marine scalefish fishery with the creation of new fisheries under their own regulations (PIRSA, 2023b).

Histroically, effort within this fishery was widespread across most of the State's marine fishing areas, however, since 2000, fishing effort is largely concentrated within the gulfs near Adelaide. Between 2016 and 2020, effort in fishing blocks for the South Australian Marine Scalefish Fishery was greatest in the Coorong Coast between Victor Harbour and Cape Jaffa (in excess of 400 boat days in blocks 46 and 51), with effort decreasing with increasing distance from shore. The OA overlaps with fisheries block 58, where fishing effort in 2016 – 2020 was 201 – 300 boat days (**Figure 66**).



Note: The OA and AA have been revised since this image was produced, with the revised areas overlaid on top.

Figure 66 Fishing Intensity (Boat Days) in the South Australian Marine Scalefish Fishery (2016 – 2020)

4.7.3.5.3.1 Sardine Fishery

The South Australian Sardine Fishery is a component of the Marine Scalefish Fishery that targets the Australian sardine and Australian anchovy. The fishery covers all South Australian waters out to the 200 NM EEZ. Fish are caught using the purse seine method using sardine nets. Sardines are primarily used as feed for the southern bluefin tuna ranching industry, with small amounts also sold for human consumption and as recreational bait (PIRSA, 2014).

The fishery is extremely visible, based in the line of sight of main towns (PIRSA, 2014). As a result, there will not be any overlap between the OA and Sardine Fishery, although there may be overlap with the EMBA in coastal waters along the South Australian coastline.

4.7.3.5.4 Abalone Fishery

The South Australian commercial abalone fishery is divided into three zones: Western Zone, Central Zone, and Southern Zone. The fishery targets blacklip abalone and greenlip abalone, during the fishing season which runs from 1 October to 30 September (Burnell *et al*., 2022).

Following the detection of abalone viral ganglioneuritis at Cape Nelson (VIC) and some NSW abalone processors in May 2021, temporary restrictions were put in place to keep South Australians waters free of the disease. There are currently no new licences available for commercial fishing in the South Australia abalone fishery (PIRSA, 2023c).

As this fishery is a dive-based fishery, there will be no overlap with the OA, however, some overlap may occur between the fishery and the EMBA in coastal locations of Southern Australia.

4.7.3.5.5 Charter Boat Fishery

The South Australian Charter Boat Fishery provides recreational fishers (clients) with access to South Australian fisheries resources through the provision of purpose-built vessels, experienced operators, and modernised technology. Clients typically use rod and lines, but are also permitted to use bait pumps, cockle and crab rakes, crab nets and lobster pots. Operators can provide additional services such as diving expeditions, ecotours and passenger trips. The fishery can operate in all coastal waters, including the gulfs and bays from the borders of South Australia/Western Australia and South Australia/VIC. The main species targeted in this fishery are snapper, King George whiting, bight redfish, Western Australian salmon, snook, silver trevally, southern bluefin tuna, southern calamari, and southern garfish. Although fishing charters operate within water depths greater than 250 m, these waters represent a small proportion of fishing destinations (0.63% of mean annual effort), with most activity occurring in inshore regions where water depths are 50 m or less (76% of charter activities) (Durante *et al*., 2022).

Due to the offshore nature of the OA, it is unlikely that the charter boat fishery will overlap with the OA, however, this fishery may overlap with the EMBA.

4.7.3.5.6 Miscellaneous Fishery

The South Australian Miscellaneous Fishery includes species that are not in management arrangements of existing commercial fisheries, specialised fisheries, and multiple types of fishing gear. Many of the fisheries are low production, low value, or both. Species taken by the Miscellaneous Fishery include sea urchins, scallop, native oyster, giant crab, Australian salmon, beachcast seagrass and macro-algae, Eyre golden perch, Welch's grunter, and Barcoo grunter (PIRSA, 2023d).

There may be some overlap between the OA and Miscellaneous Fishery, particularly when giant crab is targeted (**Section 4.7.3.5.2**). Miscellaneous Fisheries will likely also overlap with the EMBA.

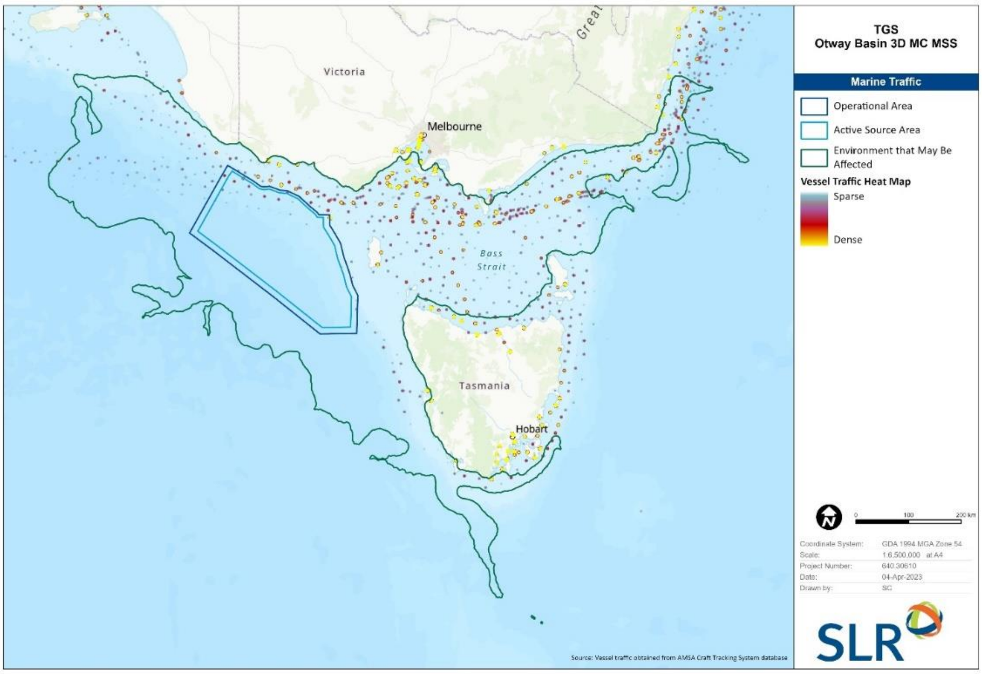
4.7.3.6 New South Wales Managed Fisheries

The NSW Department of Primary Industries manages fisheries within NSW State waters. The NSW State-managed fisheries overlapping the EMBA include the Ocean Trawl Fishery, Ocean Trap and Line Fishery, Ocean Hauling Fishery, Lobster Fishery, Abalone Fishery, Sea Urchin and Turban Shell Fishery and Developmental Commercial Fisheries. There is no overlap of these fisheries with the OA.

Due to the small overlap of the EMBA with NSW waters and that a marine fuel spill is highly unlikely, NSW fisheries have not been described further within this EP.

4.7.4 Shipping

Shipping activity in the SEMR encompasses cargo shipping and passenger shipping (passenger service and ferry service). The SEMR is home to some of Australia's busiest shipping routes including the Bass Strait, east-west and west-east international trading routes. A major shipping port exists at Portland, approximately 45 km north of the OA. Vessel traffic within the vicinity of the OA is shown in **Figure 67.**



Note: The above map only shows the vessels that have AIS onboard, vessels which don't have AIS will not be shown.

Figure 67 Marine Traffic Density (March 2022 – February 2023)

4.7.5 Oil and Gas Activities

4.7.5.1 Petroleum Titles and Production

The region currently supports a number of industries including petroleum exploration and production. Other exploration activities, such as seismic surveys, may occur within and surrounding the OA over the duration of this EP. The Thylacine platform is located within permit T/L2 which partially overlaps the OA.

Petroleum titleholders with titles that are located within the OA are listed in **Table 36** and presented in **Figure 68**.

Table 36 Petroleum Titles overlapping the OA

Permit	Permit Type	Petroleum Operator
VIC/P79	Exploration permit	ConocoPhillips Australia SH2 Pty Limited
T/30P	Exploration permit	Beach Energy (Operations) Limited
T/49P	Exploration permit	ConocoPhillips Australia SH1 Pty Limited
T/L2	Production licence	Beach Energy (Operations) Limited
T/L3	Production licence	Beach Energy (Operations) Limited
T/L4	Production licence	Beach Energy (Operations) Limited

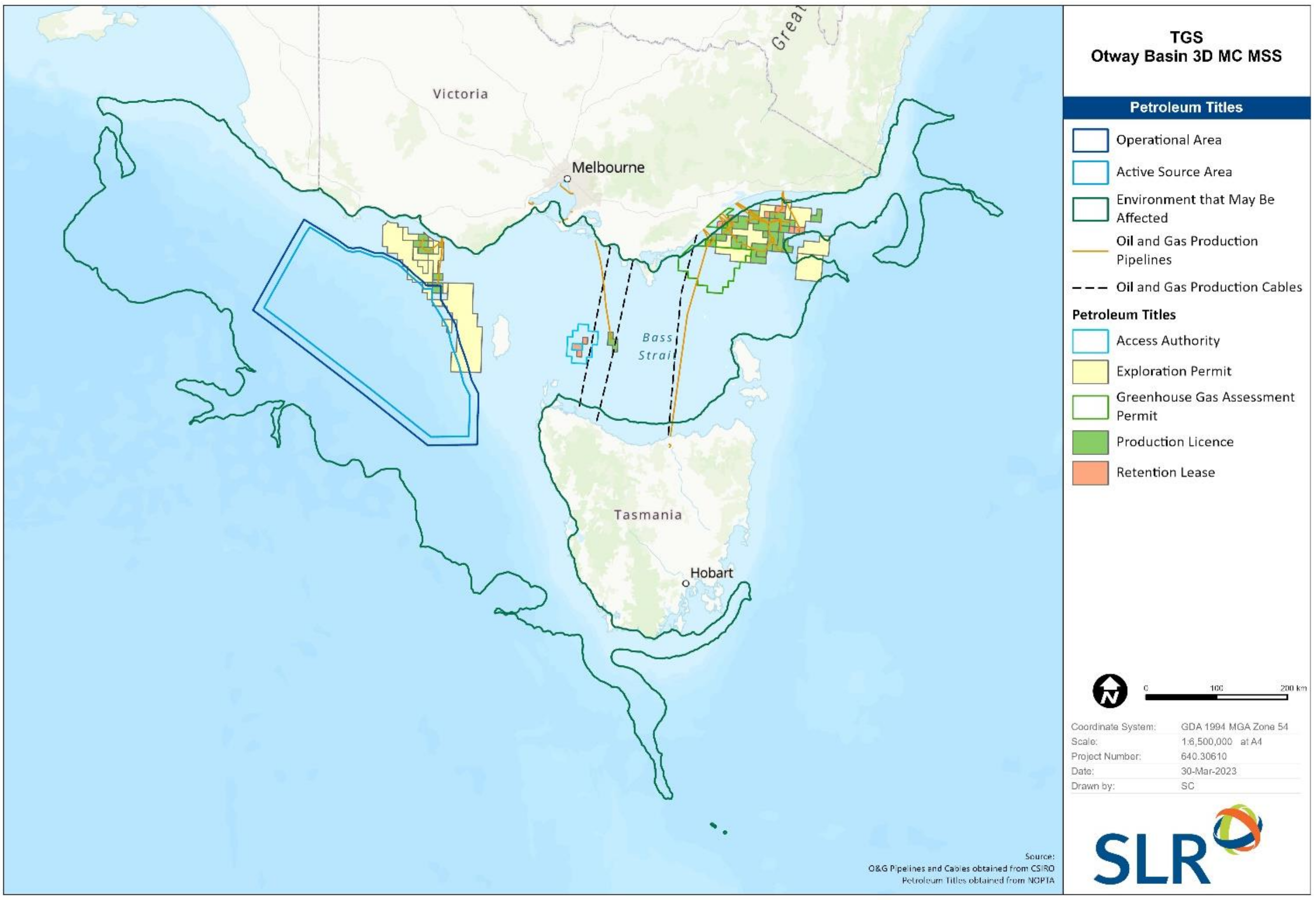


Figure 68 Offshore Petroleum Titles in the vicinity of the OA and EMBA

4.7.6 Submarine Cables

Of relevance to the OA is the INDIGO cable system. This cable system spans a total of 9,200 km and consists of two distinct cable projects; the Indigo West project and the Indigo Central project, the latter of which is of relevance to the Otway Basin 3D MC MSS. The Indigo Central project consist of 4,600 km of cable connecting Perth to Sydney and overlaps directly with the OA (**Figure 69**).

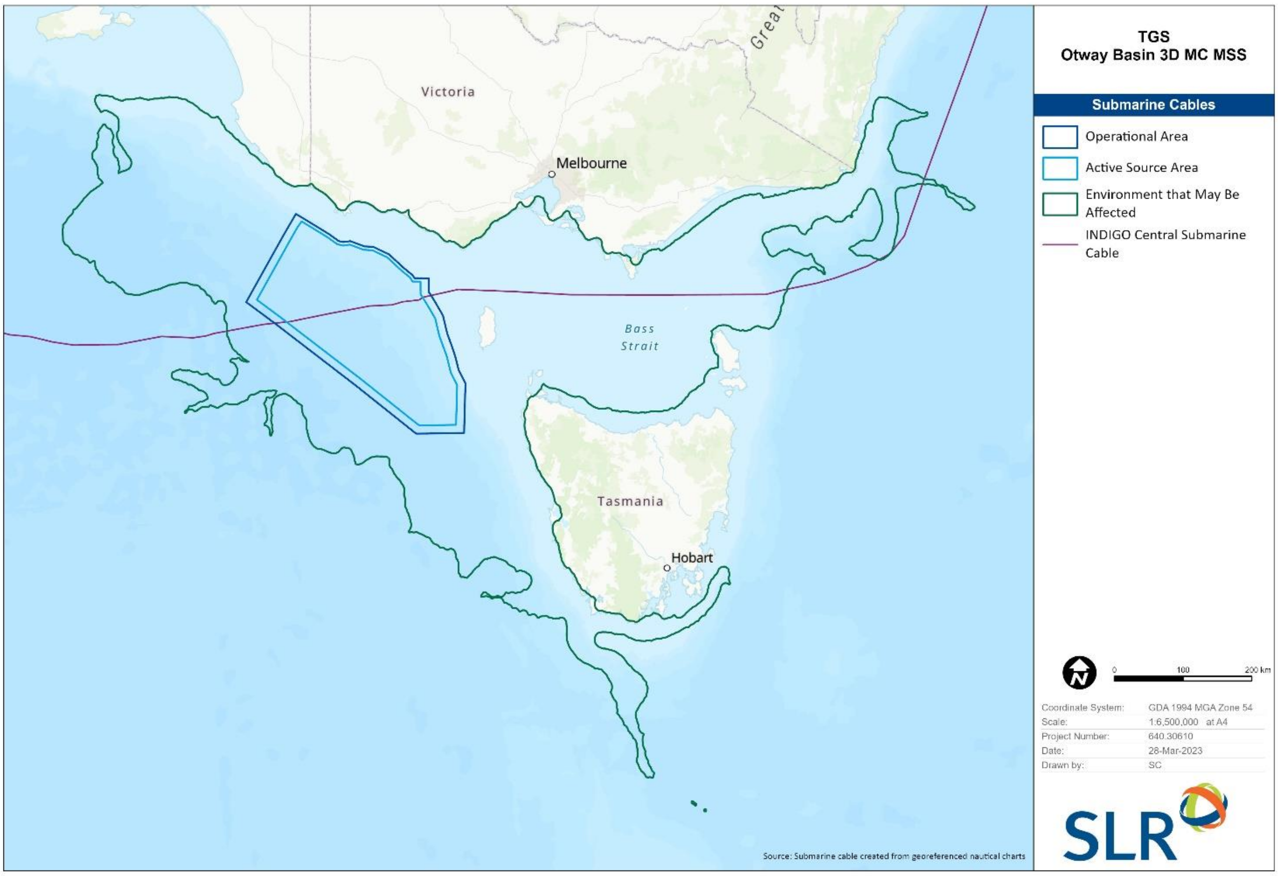


Figure 69 Submarine Cables of Relevance to the OA

4.7.7 Defence Activities

There are many areas throughout Australia that are either confirmed as, or suspected of being, affected by unexploded ordnance (**UXO**) as a result of military activities by Australian and allied military forces, particularly during World War II. UXO include any explosive ordnance (e.g. ammunition, projectiles, mortars, bombs, grenades, torpedos, etc) that have been fired and failed to function as intended (Department of Defence, 2018). Mustard gas (sulphur mustard) was the most common type of chemical warfare agent dumped at sea (Plunkett, 2018).

The Department of Defence operate military firing practice and exercise areas at various locations around Australia. A defence training area and defence practice area lie off the southeast coast of Kangaroo Island, 190 km from the OA.

The Department of Defence maintains a record of sites confirmed as, or reasonably suspected of, being affected by UXO. A search of the Department of Defence's UXO map confirmed eight UXO sites occur in the vicinity of the OA including:

- 1191 Coastal Waters – UXO Category. Also Kangaroo Island 009, includes Site ID 1192
- SDG064 Sea Dumping – Victorian Coast. This is an area used for the dumping at sea of ordnance and other items. This site was used for the dumping at sea of ammunition including 59 cases of weapons. UXO Category: Other Sea Dumping Sites
- SDG135 Sea Dumping – Victorian Coast. This site is an area used for the dumping at sea of ordnance and other items. This site was used for the dumping at sea of ammunition including inert metal missile parts. UXO Category: Other Sea Dumping Sites.
- SDG110 Sea Dumping – Bass Strait. This site is an area used for the dumping at sea of ordnance and other items. This site was used for the dumping at sea of ammunition including 2331 boxes of detonators and 144 boxes of explosives. UXO Category: Other Sea Dumping Sites;
- SDG136 Sea Dumping – Victorian Coast. This site is an area used for the dumping at sea of ordnance and other items. Site of post WWII Sea Dumping Activity. UXO Category: Other Sea Dumping Sites;
- SDC006 Sea Dumping – Off King Island. This site is an area used for the dumping at sea of ordnance and other items. This site was used for the dumping of chemical munitions including 1,634 tons of chemical munitions in 1948. UXO Category: Other Sea Dumping Sites;
- SDG087 Sea Dumping – King Island. This site is an area used for the dumping at sea of ordnance and other items. This site was used for the dumping at sea of ammunition including cartridges, projectiles, and fuses. UXO Category: Other Sea Dumping Sites;
- 1052 – King Island. This site was used during 1958 as an Air to Air Firing Range. UXO Category: Slight Potential.

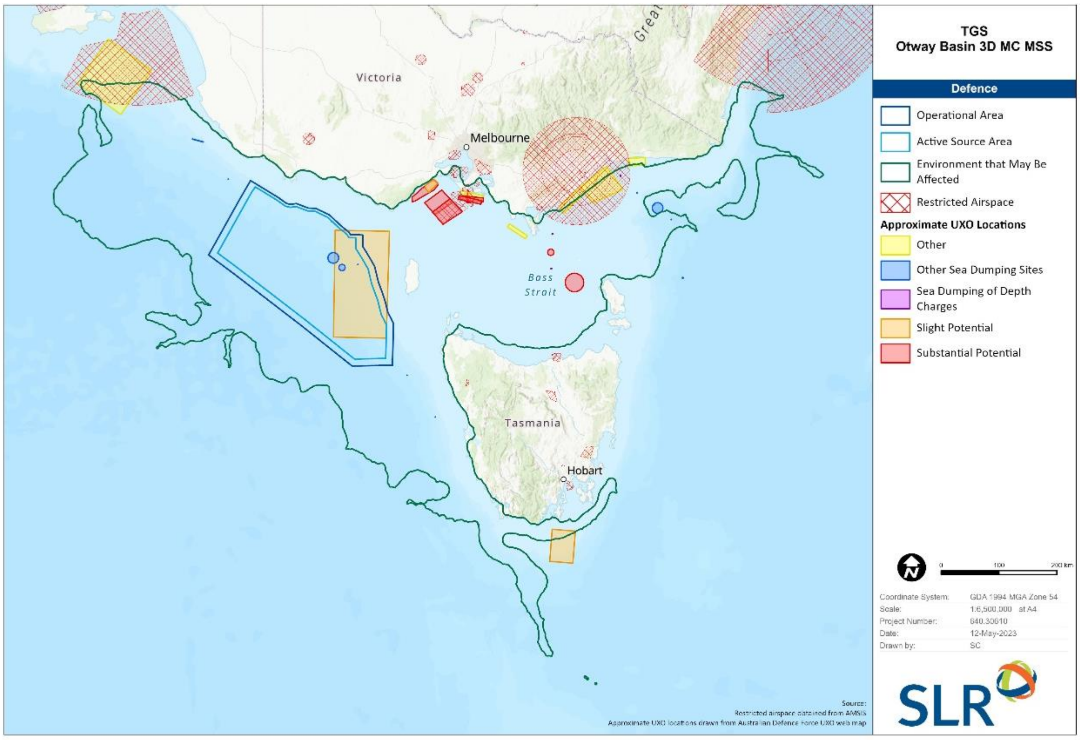


Figure 70 Defence Activities and UXOs Within the OA and EMBA

4.7.8 Research Activities

Several research organisations conduct research activities throughout South Australian, VIC, and TAS marine waters. A summary of research organisations that potentially have interests in the OA is provided below. **Section 5** outlines the consultation undertaken with research organisations, with full correspondence provided in **Appendix H**.

- **Blue Whale Study Inc**. – The study area of Blue Whale Study Inc. covers the continental shelf and support slope waters between 40°30'S, 144°E and 33°20'S, 131°07'E, from western Bass Strait to the eastern GAB. The primary interest of Blue Whale Study Inc. is the ecology of the pygmy blue whale in the Bonney Upwelling and surrounding waters of south-east Australia. Aerial surveys and photo-identification are core research priorities of the group, although other works include deployment and tracking of tags (e.g. satellite tags, suction-cup attached dive loggers), and modelling of feeding habitat in the region.

  Blue Whale Study Inc. provide consultation services to government and industry that operated in whale feeding areas and marine mammal monitoring and research services to industry; control measures for the Otway Basin 3D MC MSS regarding marine mammals have been developed in consultation with Blue Whale Study Inc (Blue Whale Study Inc., 2023).

- **Deakin University** – Deakin University is a public university in VIC, with main campuses in Melbourne's Burwood suburb, Geelong Waurn Ponds, Geelong Waterfront, and Warrnambool. Students undertaking research for their university studies may utilise coastal waters along the coastline inshore of the OA.

- **Australian Right Whale Research (ARWR)** – ARWR conducts research on southern right whales, covering research topics such as population biology, photo identification and underwater acoustics at Head of Bight and Fowlers Bay in the GAB. Since 1991, ARWR have established an ongoing annual population monitoring program at the Head of Bight southern right whale aggregation grounds.

- **University of Tasmania** – The University of Tasmania is a public research university, located in Hobart, TAS. Students of the University of Tasmania conduct research in the marine environment. The Institute for Marine and Antarctic Studies (**IMAS**) is a teaching and research institute of the University.

- **Commonwealth Scientific and Industrial Research Organisation (CSIRO)** - an Australian Government agency responsible for scientific research across a range of disciplines including technology, natural environments, health and medical, environmental impacts, etc.

- **Bureau of Meteorology (BOM)** - an agency of the Australian Government that is responsible for providing weather services to Australia and surrounding areas.

- **Monash University -** a public research university based in Melbourne, VIC. Students undertaking research for their university studies may utilise coastal waters along the coastline inshore of the OA.

A search of the Parks VIC, Australian Maritime Safety Authority (**AMSA**) and Australian Hydrographic Office (**AHO**) Notice to Mariners systems was carried out in order to identify any research equipment deployed in the marine environment that may be of relevance to the OA. No Notice to Mariners were found in relation to the OA.

4.8 Periods of Peak Sensitivity or Activity within the OA

A summary of distribution, activities and peak periods for significant species and other relevant activities that may occur annually within or close to the OA is provided in **Table 37** below.

Table 37 Timing of Key Activities Relevant to the OA and the Surrounding Area

Sensitivity	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Otway Basin 3D MC MSS proposed timing												
Sharks and rays												
Great white shark foraging												
Marine mammals												
Humpback whale migration												
Pygmy blue whale (presence)					Depart upwelling system							
Southern right whale (presence)												
Sperm whale foraging[5]												
Marine reptiles												
Leatherback turtle foraging												
Marine birds												
Little penguin (presence)												
Albatrosses foraging and breeding												
Petrels foraging and breeding												
Orange-bellied parrot wintering (non-breeding) (south-east Australia)												
Fish Spawning												
Blue Warehou												
Blue Grenadier												
Orange Roughy												

Sensitivity	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Striped Trumpeter												
School Shark												
Giant Crab												
Greenlip abalone												
Blacklip abalone												
Southern Rock Lobster												
Scallop												
Snapper												
Squid												
Other demersal fish species (sustainable stock)												
Other pelagic fish species (sustainable stock)												
Commonwealth Fisheries												
Southern and Eastern Scalefish and Shark Fishery												
Bass Strait Central Zone Scallop Fishery												
Southern Squid Jig Fishery												
Southern Bluefin Tuna Fishery												
Small Pelagic Fishery (Western)												
Victorian Fisheries												
Ocean Scallop Fishery												
Rock Lobster Fishery (Western Zone) – up to 200 m depth – **Females**						Closed 1 Jun-15 Nov						

Sensitivity	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Rock Lobster Fishery (Western Zone) – up to 200 m depth – **Males**									Closed 15 Sep-15 Nov			
Giant Crab Fishery – 140 m to 300 m depth – **Females**						Closed 1 Jun-15 Nov						
Giant Crab Fishery – 140 m to 300 m depth – **Males**									Closed 15 Sep-15 Nov			
Wrasse Fishery – up to 40 m depth												
Abalone Fishery – up to 30 m depth	Fishing only permitted between sunrise and sunset											
South Australian Fisheries												
Rock Lobster Fishery (Southern Zone) – up to 200 m depth								Closed 1 Aug – 14 Sep				
Giant Crab Fishery (Southern Zone) – 100 m to 200 m depth					Closed 1 May - 30 Sep							
Scalefish Fishery (multi-species)												
Tasmanian Fisheries												
Giant Crab Fishery – 110 m to 180 m depth	Females: closed 1 Jun-15 Nov; Males: open all year-round											
Rock Lobster Fishery – up to 150 m depth												
Scalefish Fishery (multi-species)												
Peak Period												

5 Relevant Persons Consultation

Consultation with relevant persons is an integral component of the project development and planning phase of any potentially impacting activity, and TGS acknowledges that undertaking an effective consultation programme that extends for the duration of the EP is critical to the success of the Otway Basin 3D MC MSS. TGS is aware of and understands the requirements regarding appropriate consultation, as defined under the Environment Regulations and has developed an inclusive and ongoing relevant persons consultation process that will extend beyond the completion of the Otway Basin 3D MC MSS for the duration of the EP.

This section demonstrates that TGS has undertaken an extensive consultation programme in accordance with Division 2.2A and Regulation 10A(g) of the Environment Regulations and that the measures (if any) TGS has adopted, or proposes to adopt, because of the consultation process are appropriate. TGS is also committed to continuing consultation throughout the acquisition of the Otway Basin 3D MC MSS and will consult with relevant persons for the duration of the EP.

To assist with developing an effective consultation programme that informs, provides sufficient information and builds capacity in relevant persons, to the extent that they understand the potential risks and impacts associated with the proposed Otway Basin 3D MC MSS on their functions, interests and activities, TGS has been guided by Division 2.2A of the Environment Regulations, NOPSEMA Guidance Document N-04750-GL2086 A900179 (Consultation in the course of preparing an environment plan, NOPSEMA 2023) (**the Guidance Document**), and the instructive reasons given by the Full Federal Court of Australia, in its appeal decision *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 on 2 December 2022. In addition, the general principles for public participation regarded as underpinning good practice (IAP2, 2016), as well as other appropriate consultation frameworks[8] have been consulted.

5.1 Regulatory Requirements and Guidelines

In accordance with sub regulation 11A(2) of the Environment Regulations, TGS is required to consult with ‘relevant persons’ who may be affected by the Otway Basin 3D MC MSS and provide sufficient information to allow the relevant person to make an informed assessment of the possible consequences that may arise from the proposed activities on their functions, interests or activities. In addition, TGS must provide a reasonable period of time to assess the activity being proposed (i.e. the Otway Basin 3D MC MSS) and respond accordingly to raise any objections or claims they may have. Issues and concerns raised may relate to environmental, social, economic and other factors. It is expected that any such objections or claims raised are considered by TGS and, wherever practicable, incorporated into the management and control measures of the proposed Otway Basin 3D MC MSS as a component of this EP. TGS will extend this further through continuing consultation where any claims raised even during the acquisition of the Otway Basin 3D MC MSS would be assessed and if any change to management or control measures is required, would be done so through the management of change process.

The parties considered as ‘relevant persons’ and who have been engaged with as part of the consultation programme are defined within **Section 5.3** and a full list of all persons consulted is provided in **Appendix G**. For the purpose of this EP, the definition of a ‘relevant person’ followed the direction and intent of the Guidance Document and relevant paragraphs cited by the Appeal Decision. This ensured that relevant persons were identified on the basis of their functions, interests and activities in relation to the Otway Basin 3D MC MSS.

[8] https://www.dmp.wa.gov.au/Stakeholder-and-community-22456.aspx

In developing this EP and the corresponding relevant persons consultation, TGS has considered the requirements of the following:

Relevant case law:

- *Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority* (No 2) [2022] FCA 1121 (**the Primary Decision**); and
- *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (**the Appeal Decision**).

NOPSEMA:

- Guideline N-04750-GL2086 Consultation in the Course of Preparing an Environment Plan (Updated May 2023);
- Guideline N-04750-PL1347 Environment Assessment Policy;
- Guideline N-04750-GL1721 Environment Plan Decision Making;
- Guideline N-04750-GN1344 Environment Plan Content Requirements Guidance Note;
- Guidance Note N-04750-GN1847 A66207 Responding to Public Comment on Environment Plans (July 2022);
- Guideline N-04750-GL1887 A705589 Consultation with Commonwealth agencies with responsibilities in the marine area (January 2023); and
- The publication produced by NOPSEMA titled "Requirements for Consultation and Public Comment on Petroleum Activities in Commonwealth Waters" 2018.

Australian Fisheries Management Authority:

- Petroleum industry consultation with the commercial fishing industry (https://www.afma.gov.au/sustainability-environment/petroleum-industry-consultation), accessed December 2021.

Commonwealth Department of Foreign Affairs and Trade:

- Engage with DFAT (https://www.dfat.gov.au/trade/engage-with-dfat), accessed December 2021.

State Governments (VIC, TAS, NSW, SA) Department of Fisheries:

- Guidance statement for oil and gas industry consultation with the Department of Fisheries 2013.

State Governments (VIC, TAS, NSW, SA) Department of Transport:

- Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements 2020.

5.2 Relevant Persons Consultation Objectives

TGS has identified a set of key objectives for the relevant persons consultation programme. These objectives were developed with the intention to inform and build capacity in relevant persons, to the extent that they understand the potential risks and impacts associated with the proposed Otway Basin 3D MC MSS on their specific functions, activities and interests, and to make available the opportunity to raise any concerns, objections or claims they may have. In addition, this consultation will ensure TGS understands the concerns each relevant person may have and hear suggestions on how these concerns can be mitigated through appropriate controls in the EP. Finally, to ensure that wherever practicable concerns raised are incorporated into the management of the proposed Otway Basin 3D MC MSS as a component of this EP.

The key objectives for the relevant persons consultation programme included:

- Undertake the consultation process in accordance with the key principles of effective consultation (Section 7 Guidance Document);
- Identify all relevant persons in accordance with the Guidance Document, supplementary documents and the Appeal Decision;
- Initiate and ensure ongoing transparent, open and honest communication with all relevant persons;
- Provide relevant persons with sufficient information to allow them to make an informed assessment of the possible consequences of the activity on their functions, activities, values or sensitivities;
- Provide adequate opportunity (i.e. reasonable period) for relevant persons to consider and query the information and provide feedback;
- Provide a mechanism for assessing the merit of any objections or claims received;
- Where applicable, demonstrate where control measures have been incorporated as a result of relevant persons consultation feedback;
- Support ongoing relevant persons identification and consultation throughout the project; and
- Demonstrate to NOPSEMA that completed and continuing consultation with relevant persons is consistent with the requirements of the Environmental Regulations.

5.3 Requirements for Identification of Relevant Persons

Regulation 11A of the Environment Regulations holds that the titleholder (in this case TGS) must consult each of the following (a 'relevant person'):

(a) Each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;

(b) Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;

(c) The Department of the responsible State Minister, or the responsible Northern Territory Minister;

(d) A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan; and

(e) Any other person or organisation that the titleholder considers relevant.

On 21 September 2022, Justice Bromberg handed down his judgement in the Primary Decision. One of the issues covered in the judgement was how titleholders should identify the *"universe of relevant persons"* that may fall within section 11A(1) of the Environment Regulations. The process of identifying relevant person(s) is the first step in fulfilling the requirements of section 11A of the Environment Regulations.

As stated by Justice Bromberg in the Primary Decision, determining who falls within the description of (a), (b), (c) and (e) is a "*relatively straightforward exercise*" (para. 136 of the Primary Decision). However, the description of a relevant person in (d) can raise "*substantial complexity*" (para. 137 of the Primary Decision) as:

- The number of persons falling within the description may be very large and in numerous categories;
- The words "*functions, interests or activities*" must be construed with their intended meaning; and
- The nature and extent of any potential effect upon the "*functions, interests or activities*" or particular persons or the categories of particular persons may be difficult to assess.

Further to the above, the Appeal Decision (and subsequently the Guidance Document) provides guidance on the phrase "*functions, interests or activities*". Based on these two documents, the phrase "*functions, interests or activities*" should be constructed broadly as it best promotes the objects of the Environment Regulations, including that activities are carried out in a manner consistent with the principles of ESD. The phrase is a composite one, each part of which has work to do in identifying relevant persons. The meaning of each part of the phrase is defined in the Guidance Document as follows:

- Functions – refers to "*a power or duty to do something*" (para. 60 of the Appeal Decision);
- Interests – to be construed as conforming with the accepted concept of "*interest*" in other areas of public administrative law. Includes "*any interests possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation*" (para. 63 & 65 of the Appeal Decisions); and
- Activities – to be read broadly and is broader than the definition of 'activity' in regulation 4 of the Environment Regulations and is likely directed to what the relevant person is already doing (para. 51, 58 and 59 of the Appeal Decision).

A methodology has been developed to accurately and transparently determine the relevant person(s) associated with the Otway Basin 3D MC MSS, including those whose functions, interests, or activities as per (d) may be affected by the activities proposed. This methodology also includes an identification of those relevant person(s) that fall under (a), (b), (c) and (e) of 11A(1) above.

For the purpose of this EP, and in accordance with the Guidance Document (Section 6), the process of identifying relevant persons under Section 11A(1)d) has encompassed the concept of 'Decisional Choice' of which individuals/organisations may have functions, interests or activities in the activities proposed to be undertaken as part of this EP.

5.4 Method for Identification of Relevant Persons

In accordance with the Guidance Document, this section sets out the process by which relevant persons were identified through initial consultation and will continue to be identified through continuing consultation throughout the duration of the Otway Basin 3D MC MSS. The process followed by TGS is outlined below:

1. Scope out the proposed activity to ensure it is properly understood by the titleholder;
2. Determine the potential impacts and risks associated with the activity;

3. Determine the extent of the EMBA by the activity;
4. Characterise the environment within the EMBA by developing a broad understanding of the values and sensitivities in the EMBA; and
5. Identify relevant persons by determining potential functions, interests or activities of persons that may intersect with the OA or EMBA. As part of this process, each relevant person(s) will be assessed on a case-by-case basis to enable appropriate consultation based on their potential functions, interests, or activities within the EMBA.

Each of these four steps in TGS's methodology for identifying relevant persons are discussed in further detail in the following sections. This process ensures that relevant persons are identified not only in terms of the spatial boundary of the OA or EMBA but were also identified in regard to their functions, interests or activities bound by the values and sensitivities of the EMBA.

The consultation undertaken with these relevant persons is outlined further in **Section 5.5**.

5.4.1 Scope the Activity

The first important step of any consultation methodology is to ensure that the proposed activity is properly understood by the titleholder, including the potential impacts and risks associated with that activity to enable identification of relevant person(s). This involves TGS determining the scope and extent of the phase or stage of activity, including any associated activities, proposed to be commenced.

A detailed description of the proposed Otway Basin 3D MC MSS is included within **Section 3**, and outlines the Otway Basin 3D MC MSS location, the timing and duration of the Otway Basin 3D MC MSS and the specifications of the Seismic Survey including source configuration, streamer configuration, sail lines and the project related vessels.

5.4.2 Determine the Impacts and Risks

A detailed discussion on the potential impacts and risks associated with the activity is included within **Section 6.1** of this EP, which resulted in the identification of the following activities which may result in impacts or risks to the functions, interests or activities of potentially relevant person(s):

- Planned activities:
  - Physical presence of the Seismic Vessel and towed equipment (**Section 7.1**);
  - Acoustic disturbance to the marine environment (**Section 7.2**);
  - Routine permissible waste discharges (**Section 7.3**);
  - Atmospheric emissions (**Section 7.4**); and
  - Artificial light emissions (**Section 7.5**).
- Unplanned activities:
  - Establishment of invasive marine species (**Section 8.1**);
  - Streamer loss (**Section 8.2**);
  - Vessel collision or sinking, and potential fuel spill from ruptured fuel tanks, if any (**Section 8.3**);
  - Hydrocarbon spill response (**Section 8.4**); and

- Accidental release of hazardous and non-hazardous materials (**Section 8.5**).

5.4.3 Determine the Extent of the EMBA

To identify potentially relevant person(s), the environment that may be affected (**EMBA**) needs to be defined in order to determine the potential exposure for those relevant person(s). As discussed within **Section 4.1**, most activities (either planned or unplanned) associated with the Otway Basin 3D MC MSS may affect the environment up to a few kilometres from the source location which is constantly moving through the Acquisition Area. A significant unplanned event, such as a vessel fuel oil spill, has the potential to impact the existing environment over a substantially larger area than that affected by planned activities, and minor unplanned events. Therefore, an EMBA was derived using stochastic fuel oil dispersion and fate modelling. This modelling simulated the occurrence of 100 realistic spill events of 1,066 m^3 of MDO from five locations within the OA, randomly distributed over the previous decade. An output of this modelling was the maximum extent at which various environmental thresholds were reached, including for floating, entrained, dissolved and shoreline accumulations of hydrocarbons.

The extent of the EMBA was based on a combination of the maximum extent of the fuel oil spill trajectory at which entrained hydrocarbons were above the low threshold from each of the five modelled release locations. Utilising the maximum extent from all five spill locations results in a worst-case scenario for the spatial extent of impacts from the Otway Basin 3D MC MSS.

As displayed in **Figure 7** of **Section 4.1**, the EMBA extends beyond the OA into coastal areas from the eastern extent of South Australia, along most of the Victorian coastline and Bass Strait to the southern part of New South Wales, and extends south from the northwestern coastline of Tasmania and down and beyond the west and southern coastline of Tasmania.

5.4.4 Characterise the Environment within the OA and EMBA

The EMBA is an important tool to assist TGS with determining the extent to which the values and sensitivities need to be considered in relation to the Otway Basin 3D MC MSS. Once the environment within this EMBA has been characterised, it is then possible to determine the person(s) which fall within (a) to (e), listed in **Section 5.4.1** above, that may be impacted.

Section 4 provides a detailed characterisation of the values and sensitivities of the environment within the EMBA, including details on the physical environment, marine protected areas and sensitive areas, the biological environment, cultural and heritage values, and the socio-economic environment. The values and sensitivities associated with the EMBA have been guided by various databases and search tools, including the Protected Matters Search Tool from the DoCCEEW, the National Native Title Register search tool, the Australasian Underwater Cultural Heritage database, the National Electronic Approvals Tracking System and commercial fisheries data using the CAES blocks. From this guidance, further details on specific values and sensitivities have been established from published literature, bioregional planning documents, EPBC Act Conservation Management Plans, Recovery Plans and Conservation Advice, organisation strategic plans and annual reports, along with details provided by relevant persons where provided. Utilising this detailed information, it is then possible to accurately determine the functions, interests or activities that relevant persons may have with any aspect of the existing environment.

5.4.5 Identification of Relevant Persons for Informing Consultation Effort

As stated in Section 7 of the Guidance Document, the consultation process should be appropriate for the category of relevant person, and the type of function, interest, or activity; where interests are held communally, the method of consultation will need reasonably to reflect the characteristics of the interests affected by the proposed activity.

The identification of relevant person(s) is a key step in the preparation of an EP due to the requirement of regulation 11A in that a titleholder must consult with each relevant person. Regulation 11A(2) and (3) requires the titleholder to give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person and allow the relevant person a reasonable period for the consultation.

It is considered that not all relevant persons require the same amount of information or period for consultation based on the various different functions, interests or activities of the relevant person and the manner in which they may be impacted by the Otway Basin 3D MC MSS. As such, a system has been developed as outlined in **Section 5.4.5.1** as a starting point for consulting with relevant persons. Where relevant persons identified the need for additional information or additional time to adequately assess the potential impacts from the Otway Basin 3D MC MSS on their functions, interests, or activities then this was worked through with them on a case-by-case basis to ensure a bespoke consultation process was followed where required.

5.4.5.1 Consultation effort

As outlined above, relevant persons have different functions, interests or activities associated with the EMBA and as such, warrant different levels of effort of consultation. The methods recognise the process is iterative, and not a 'one-size-fits-all' method can be applied across all relevant persons, or potentially relevant persons. It needs to recognise efforts/methods across individual relevant persons is guided by the amount and format of the information to be exchanged, if sufficient information has been provided, and the differences in timeframes required, to ensure relevant persons have sufficient timeframes to respond (**Section 5.4.5**). Effort is therefore guided by the factors unique for each relevant persons, as determined by their area across which their functions, interests or activities overlap with sensitivities in the EMBA or OA (noting that the OA and EMBA areas are defined terms in this EP).

Where a relevant person has requested bespoke consultation requirements, TGS has sought to accommodate those requirements to ensure that the relevant person is able to receive sufficient information and to have a reasonable opportunity to be consulted. For example, in some cases, TGS was not willing to proceed with in-person consultation events because there has been inaccurate and misleading information shared by those groups within online media. TGS made an assessment that for those groups, online consultation sessions will better enable the relevant persons to receive accurate information and ask questions about the proposal. This has enabled TGS to reasonably share the accurate information about the proposal and ensure interest-based concerns can be raised and receive a reasonable response. Another bespoke requirement that TGS has accommodated is in relation to level of engagement. For example, where a relevant person has initially indicated a low effort of consultation may be sufficient, if that relevant person subsequently indicated they require further or continuing consultation, this is accommodated into the consultation framework as required.

5.4.5.2 Relevant Person Identification

5.4.5.2.1 Relevant Person Identification under Regulation 11A(1)(a), (b), (c) and (e)

As stated by Justice Bromberg in the Primary Decision, determining who falls within the description of regulation 11A(1)(a), (b), (c) and (e) is a relatively straightforward exercise. Due to the prescribed nature of the requirements of regulation 11A(1)(a), (b), (c) and (e) the methods for identifying relevant persons under these parts relies on industry and expert knowledge and experience (including previous work history) and the use of other EPs associated with seismic surveys which have similar risks and impacts as the proposed Otway Basin 3D MC MSS. In addition to this, searches of publicly available information, including, but not limited to, government databases and registers, web searches for background information on functions, interests or activities were conducted.

Based on the above, TGS has utilised previous operational experience in Australia and expert knowledge of the impacts and risks of the Otway Basin 3D MC MSS, along with assessing recently approved EPs for seismic surveys to identify a list of relevant persons under regulation 11A(1)(a), (b), (c) and (e). **Table 38** provides an outline of those person(s) who are considered relevant under (a), (b), (c) and (e) along with a justification as to why they are considered relevant under the Environment Regulations.

It is noted that only those relevant persons confirmed as relevant for the purpose of this EP are listed in **Table 38**. All records of potentially relevant persons communicated with by TGS are listed in **Appendix H**, where the potentially relevant person has confirmed they are not considered as relevant for the purpose of this EP, a record of this is indicated.

Table 38 Regulation 11A(1)(a), (b), (c) and (e) Relevant Person Identification

Relevant Person	Justification
Regulation 11A(1)(a): Each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant	
Australian Communications and Media Authority (**ACMA**)	The ACMA is the statutory body responsible for regulating communications and media services in Australia, including the submarine cable regime. A previous EP found ACMA to be included as a relevant person for the proposed survey (on the basis information received by a third-party relevant persons), as there may be submarine cable systems managed by ACMA in the vicinity of the Otway Basin 3D MC MSS.
Australian Fisheries Management Authority (**AFMA**)	The AFMA is the Australian Government agency responsible for the management and sustainable use of fisheries resources including combating illegal fishing activities in the Australian Fishing Zone that covers 8,148,250 square kilometres, the third largest in the world and in most of Australia's EEZ, which extends to 200 nautical miles (370 km) from the coastline of Australia and its external territories, except where a maritime delimitation agreement exists with a state. AFMA is an agency of the Australian Department of Agriculture, Fisheries and Forestry (formerly the Department of and Water Resources). AFMA is responsible for the efficient management and sustainable use of Commonwealth fish resources. As the Otway Basin 3D MC MSS has the potential to impact Commonwealth managed fisheries, the AMFA is considered relevant, including those specific fisheries that operate in the Southern waters of the GAB, Bass Strait and Tasman Sea. Specific details of commonwealth managed fisheries under Australian Fisheries Management Authority is included within the assessment under 11A(1)(d), contained within **Table 28**.
Australian Hydrographic Office (**AHO**)	The AHO is responsible for the publication and distribution of nautical products and other information required for the safety of ships navigating in Australian waters. The Otway Basin 3D MC MSS will pose a potential risk to the safety of other ships navigating in the area, therefore the AHO is considered to be a relevant person. In addition, the Otway Basin 3D MC MSS is required to be notified to the AHO by TGS a minimum of three weeks prior to the commencement of activities.

Relevant Person	Justification
Australian Maritime Safety Authority (**AMSA**)	The AMSA is Australia's national regulatory body promoting the safety and protection of the marine environment and combating ship-sourced pollution and provides for the infrastructure and safety of navigation in Australian waters. Based on this, it is considered AMSA is a relevant person under regulation 11A(1)(a).
Department of Agriculture, Fisheries and Forestry (**DAFF**)	The DAFF operates across a range of regulations across agriculture, forestry, and fisheries. Relevant to this EP, the DAFF enforces laws related to biosecurity controls of pest and disease risks of vessels arriving in Australia and as such are considered a relevant person. It is worth noting that the DAFF was, up until 30 June 2022, the Department of Agriculture, Water and the Environment with which TGS also consulted.
Department of Climate Change, Energy, the Environment and Water (**DCCEEW**)	The DCCEEW protects Australia's natural environment and heritage sites, helps respond to climate change and carefully manages water and energy resources. The DCCEEW is considered a relevant person due to the overarching directive in managing the natural environment and due to the potential impacts and risks associated with the Otway Basin 3D MC MSS, particularly with reference to Marine Parks and feedback from the Director of National Parks. Parks Australia and the Director of National Parks (**DNP**) are responsible for the six national parks, 60 marine parks and the Australian National Botanic Gardens. The OA associated with the Otway Basin 3D MC MSS overlaps with two AMPs, with the EMBA overlapping with a further eight AMPs, and as such the requirements for managing potential risks and impacts on those AMPs from the Otway Basin 3D MC MSS results in Parks Australia and the DNP being considered relevant persons. It is worth noting that the DCCEEW was, up until 30 June 2022, the Department of Agriculture, Water and the Environment with which TGS also consulted (see **Appendix G**).
Department of Defence (**DoD**)	The DoD manages Royal Australian Navy training activities at sea. Their Maritime Activities Environmental Management Plan recognises that some key training areas are locations where a number of differing activities may be conducted simultaneously, accordingly, separate Planning Handbooks have been developed for these areas to assist exercise planners in considering the environmental implications of various activities in their area. Peacetime activities include maritime surveillance and response within Australia's offshore maritime zones, hydrographic, oceanographic and meteorological support operations. Bases are established in Hobart, Tasmania and Cerebus, Melbourne. Defence activities have been identified in the OA (historic UXO dump sites) and in the wider EMBA and as such the DoD are considered relevant persons and has been consulted with.
Fisheries Research and Development Corporation (**FRDC**)	The FRDC promotes planning and investment in fisheries research and development (**R&D**) to support the sustainability of aquatic sectors and aquatic ecosystems. It is a statutory corporation under the Primary Industries Research and Development Act 1989 and is responsible to the Minister for Agriculture, Fisheries and Forestry. Its stakeholders include indigenous, commercial and recreational fishing and aquaculture. As such, the FRDC are considered relevant persons and as such has been consulted with.
Geoscience Australia (**GA**)	GA is an agency of the Australian Government that carries out geoscientific research and is the government's technical adviser on all aspects of geoscience, and custodian of the geographic and geological data and knowledge of the nation. GA is considered a relevant person due to their experience with and research into marine seismic surveying.
National Native Title Tribunal (**NNTT**)	The NNTT is an independent body established under the Native Title Act 1993 in Australia as a special measure for the advancement and protection of Aboriginal and Torres Strait Islander peoples. One of its functions is to assist people in negotiations about proposed developments, and to arbitrate in some situations where the people cannot reach agreement about proposed developments. As such, the NNTT are considered relevant persons and as such has been consulted with.

Relevant Person	Justification
National Offshore Petroleum Titles Administrator (**NOPTA**)	NOPTA administers titles and data management for petroleum and greenhouse gas titles in Australian Commonwealth waters in support of the effective regulation and management of offshore petroleum resources consistent with good oil field practice and optimum recovery. Seismic surveys are an integral aspect of developing Australia's offshore petroleum resources. Due to their administrative role in offshore petroleum resources, NOPTA is considered a relevant person, and as such has been consulted with.
Regulation 11A(1)(b): Each Department or agency of a State to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant	
Victoria Departments or Agencies	
Coastcare Victoria	Coastcare Victoria is a collection of community groups and volunteers who have an interest in the protection and management of Victoria's 2000 km of coastline. Coastcare Victoria have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Coastcare Victoria are considered relevant persons and have been consulted with.
Colac Otway Shire Council	The Colac Otway Shire Council is a local government area located in Victoria's south-west coast. The shire covers an area of 3,438 km^2 and had a population of 22,177 in 2022. The Colac Otway Shire Council has interests within their shire's coastal and marine areas which overlap the EMBA. As such, the Colac Otway Shire Council is considered a relevant person and has been consulted with.
Commissioner for Environmental Sustainability of Victoria (Department of Energy, Environment and Climate Action)	The Commissioner for Environmental Sustainability for Victoria provides independent scientific reporting to inform policymakers, scientists, and the wider Victorian community on the state's natural environment and supports ecological sustainable development. The Commissioner is an independent statutory role and is a Governor in Council appointment who prepares statutory reports according to the Commissioner for Environmental Sustainability Act 2003. The Commissioner for Environmental Sustainability of Victoria was suggested by another relevant person as potentially having interests in the Otway Basin 3D MC MSS. As such, the Commissioner for Environmental Sustainability of Victoria is considered a relevant person and have been consulted with.
Corangamite Shire Council	The Corangamite Shire Council is a local government area located in Victoria's southwest region. The shire covers an area of 4,408 km^{2}and had a population of 16,140 in June 2018. The Corangamite Shire Council has interests within their shire's coastal and marine areas which overlap with the EMBA. As such, the Corangamite Shire Council is considered a relevant person and has been consulted with.
Department of Energy, Environment and Climate Action	The Department of Energy, Environment and Climate Action is responsible for various matters related to the environment, including the coastal environment, energy, and climate change. The department was renamed from the Department of Environment, Land, Water and Planning on 1 January 2023. As such, the Department of Energy, Environment and Climate Action are considered relevant persons and have been consulted with.
Department of Transport and Planning (VIC)	The Department of Transport and Planning (formerly known as the Department of Transport) is responsible for planning and operating transport across Victoria, including maritime affairs within Victoria. The Department of Transport and Planning has interests within the Victorian waters that overlap the EMBA. As such, the Department of Transport and Planning is considered a relevant person and has been consulted with.
East Gippsland Shire Council	The East Gippsland Shire Council is a local government area located in Victoria's eastern region. The shire covers an area of 20,940 km^{2}and had a population of 46,818 in June 2018. The East Gippsland Shire Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the East Gippsland Shire Council is considered a relevant person and has been consulted with.

Relevant Person	Justification
Environmental Protection Authority (**EPA**) - Victoria	The Environment Protection Authority Victoria is Victoria's environmental regulator. It is an independent statutory authority, established in 1971 under the Environment Protection Act 1970. The Environmental Protection Authority Victoria has interests in the Victorian coastal and marine area which overlaps with the EMBA. As such, the Environmental Protection Authority Victoria are considered relevant persons and have been consulted with.
Glenelg Shire Council	The Glenelg Shire Council is a local government area located in Victoria's southwest region. The shire covers an area of 6,219 km^2 and had a population of 19,665 in June 2018. The Glenelg Shire Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Glenelg Shire Council is considered a relevant person and has been consulted with.
Mornington Peninsula Shire Council	The Mornington Peninsula Shire Council is a local government area in southeastern Metropolitan Melbourne. It is located south of the Melbourne City Centre and has an area of 724 km^2 and in June 2018 it had a population of 165,822. The Mornington Peninsula Shire Council have interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Mornington Peninsula Shire Council is considered a relevant person and has been consulted with.
Moyne Shire Council	The Moyne Council is a local government area in the Barwon southwest region of Victoria, located in the south-western part of the state. It covers an area of 5,481 km^2 (and in June 2018 had a population of 16,887. Moyne Shure Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Moyne Shire Council is considered a relevant person and has been consulted with.
Parks Victoria	Parks Victoria is a government agency that was established in December 1996 as a statutory authority, reporting to the Victorian Minister for Environment and Climate Change. Its role is to protect and preserve Victoria state's natural and cultural heritage. Parks Victoria has interests in the coastal and marine areas that overlap with the EMBA. As such, Parks Victoria is considered a relevant person and has been consulted with.
South Gippsland Shire Council	The Shire of South Gippsland is a local government area located in the south-eastern part of the state. It covers an area of 3,296 km^2 and, in June 2018, had a population of 29,576. The South Gippsland Shire Council has interests within the shire's coastal and marine area which overlaps with the EMBA. As such, the South Gippsland Shire Council is considered a relevant person and has been consulted with.
Surf Coast Shire Council	The Surf Coast Shire is a local government area in the Barwon south west region of Victoria, , located in the south-western part of the state. It covers an area of 1,553 km^2 and in June 2018 had a population of 32,251. Surf Coast Shire Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Surf Coast Shire Council is considered a relevant person and has been consulted with.
Victorian Fisheries Authority (**VFA**)	The VFA is an independent statutory authority established to effectively manage VIC's fisheries resources, to benefit recreational, commercial, aquaculture and aboriginal interests. They carry out research across VIC to monitor fish stocks and fish habitat. Branches include the Fisheries Management and Science Branch, the Ocean General Fishery Manager and Rock Lobster and Giant Crab Fishery Manager. Various commercial fisheries that fall under the management of the VFA overlap with the OA and EMBA for the Otway Basin 3D MC MSS and as such the VFA are considered relevant persons and have been consulted with.
Warrnambool City Council	The City of Warrnambool is a local government area in the Barwon south-west region of Victoria located in the south-western part of the state. It covers an area of 121 $km^2$and in June 2018 had a population of 34,862. It is entirely surrounded by the Shire of Moyne and the Southern Ocean. The Warrnambool City Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Warrnambool City Council is considered a relevant person and has been consulted with.

Relevant Person	Justification
Wellington Shire Council	The Shire of Wellington is a local government area located in the eastern part of the state. It covers an area of 10,817 km^2 and in June 2018 had a population of 44,019. The Wellington Shire Council has interests within the shire's coastal and marine areas which overlap with the EMBA. As such, the Wellington Shire Council is considered a relevant person and has been consulted with.
South Australia Departments or Agencies	
Department of Energy and Mining (South Australia)	The Department for Energy and Mining is responsible for delivering reliable and secure energy supplies from South Australia's mineral and energy resources. Department of Energy and Mining (South Australia) has interests in the wider. As such, the Department of Energy and Mining (South Australia) is considered a relevant person and has been consulted with.
Department of Environment and Water (South Australia)	The Department for Environment and Water is responsible for ensuring that South Australia's natural resources are managed productively and sustainably, while improving the condition and resilience of the state's natural environment. The Department of Environment and Water (South Australia) has interests in the wider EMBA. As such, the Department of Environment and Water (South Australia) is considered a relevant person and has been consulted with.
Department of Infrastructure and Transport	The Department of Infrastructure and Transport delivers infrastructure and transport services to all South Australians. The department consists of multiple teams including The Marine Safety South Australia is an agency within the. Marine Safety South Australia
Department of Primary Industries and Regions (**PIRSA**)	The PIRSA, is an agency of the South Australian Government whose focus is the economic development of the state of South Australia. Its key areas of work include primary sector industries, including marine aquaculture and biosecurity. The Fisheries and Aquaculture division manages the state's fish stocks, along with industry and the community, by developing and implementing policy and regulations to ensure sustainable development of the aquaculture industry. It employs Fisheries Officers to monitor compliance with fishing regulations. The South Australian Research and Development Institute (**SARDI**) is the State Government's principal research institute, and forms part of PIRSA. Various commercial fisheries that fall under the management of the PIRSA overlap with the OA and EMBA for the Otway Basin 3D MC MSS and as such the PIRSA is considered a relevant person and has been consulted with.
District Council of Grant	The District Council of Grant is a local government area located in the Limestone Coast region of South Australia and is the southernmost council in the state. It has an area of 1,904 km^2 and a population of 8,203 as of 2016. The District Council of Grant have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the District Council of Grant are considered relevant persons and have been consulted with.
EPA - South Australia	The EPA is South Australia's independent environment protection regulator. It provides advice to the Minister for Environment through reports, and releases statements to the public detailing significant environmental matters. Its role also includes formulation of environmental protection policies. The EPA South Australia have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the EPA South Australia are considered relevant persons and have been consulted with.
National Parks and Wildlife Services South Australia - Marine Parks	South Australia has 19 marine parks which are overseen by the National Parks and Wildlife Services South Australia. It administers marine parks management plans and zoning arrangements including details around fishing restrictions. The National Parks and Wildlife Services South Australia have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, National Parks and Wildlife Services South Australia are considered relevant persons and have been consulted with.

Relevant Person	Justification
Wattle Range Council	Wattle Range Council is a local government area in the Limestone Coast region of South Australia. It stretches from the coast at Beachport east to the VIC border covering an area of 3,924km^2. It had a population of over 11,677 as at the 2016 census. The District Council of Wattle Range have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the District Council of Wattle Range are considered relevant persons and have been consulted with.
Tasmania Departments or Agencies	
Aboriginal Heritage of Tasmania (Part of the Department Premier and Cabinet)	Aboriginal Heritage Tasmania aims to protect and promote TAS' unique Aboriginal heritage and facilitate the return of land to TAS' Aboriginal people. It oversees the implementation of the Aboriginal cultural management outcomes of the Tasmanian Wilderness World Heritage Area Management Plan 2016. The Aboriginal Heritage of Tasmania have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Aboriginal Heritage of Tasmania are considered relevant persons and have been consulted with.
Circular Head Council	Circular Head Council is a local government body in TAS covering the far north-west of TAS. It is classified as a rural local government area with a population of 8,066, as of 2018 and covers an area of 4,898 km^2. The Circular Head Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Circular Head Council are considered relevant persons and have been consulted with.
Department of Natural Resources and Environment	The TAS Department of Natural Resources and Environment is the government department of the Tasmanian Government responsible for supporting primary industry development, the protection of Tasmania's natural environment, effective land and water management and the protection of TAS' relative disease and pest free status. The Department of Natural Resources and Environment (TAS) have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Department of Natural Resources and Environment (TAS) are considered relevant persons and have been consulted with.
Department of State Growth – Mineral Resources	The purpose of the Department of State Growth – Mineral Resources, is to give effect to government policy in relation to minerals and petroleum resources. It produces and promotes up-to-date geoscientific information on TAS as an aid to the mineral and petroleum exploration industries, other government agencies and the general public, in order to improve the State's economic position, and to promote sustainable land-use planning and environmental management. The Department of State Growth have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Department of State Growth are considered relevant persons and have been consulted with.
Environmental Protection Authority - Tasmania	The EPA's purpose is to regulate developments and activities that may impact on environmental quality and to promote best practice and sustainable environmental management. It is an independent statutory authority under the Environmental Management and Pollution Control Act 1994. The EPA Tasmania have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. EPA Tasmania is identified as the Control Agency for any oil spill that may enter coastal waters of TAS. It is the owner of the 'Tasmanian Marine Oil and Chemical Spill Contingency Plan (TasPlan). As such, the EPA Tasmania are considered relevant persons and have been consulted with.
Flinders Council	Flinders Council is a local government body in TAS, encompassing the Furneaux Group and nearby islands of Bass Strait, in the north-east of TAS. Flinders is classified as a rural local government area and has a population of 987, as of 2018. It covers a total area of 1,997 km^2. The Flinders Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Flinders Council are considered relevant persons and have been consulted with.

Relevant Person	Justification
King Island Shire Council	King Island Council is a local government body in TAS, encompassing King Island and the adjacent minor islands within Bass Strait, in the north-west of TAS. The King Island local government area is classified as rural and has a population of 1,601, as of 2018. The islands cover an area of 1,096 km^2. The King Island Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the King Island Council are considered relevant persons and have been consulted with.
Marine and Safety Tasmania	Marine and Safety Tasmania is a statutory authority that was established on 30 July 1997 to ensure the safe operation of vessels, provide and manage marine facilities and manage environmental issues relating to vessels. Marine and Safety Tasmania have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Marine and Safety Tasmania are considered relevant persons and have been consulted with.
Tasman Council	Tasman Council is a local government body situated in the south-east of TAS. It is classified as a rural local government area and has a population of 2,404 as of 2018 and covers an area of 660 km^2. The Tasman Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Tasman Council are considered relevant persons and have been consulted with.
New South Wales Departments or Agencies	
Department of Mining, Exploration and Geoscience	Mining, Exploration and Geoscience is a group within the Department of Regional NSW. Its role is to provide certainty to the mining industry and to local communities about the future of mining in NSW and to support industry to understand and fulfil its regulatory obligations. The Department of Mining, Exploration and Geoscience have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Department of Mining, Exploration and Geoscience are considered relevant persons and have been consulted with.
Department of Planning and Environment	The New South Wales Department of Planning and Environment is a department of the NSW Government, responsible for planning. It is home to business units including the Environment and Heritage, Water, National Parks and Wildlife Services, and is responsible for the NSW Government's coastal management framework. The Department of Planning and Environment have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Department of Planning are considered relevant persons and have been consulted with.
Department of Primary Industries (Marine Environment/Marine Parks)	The New South Wales Department of Primary Industries is an agency of the New South Wales Government, responsible for the administration and development for agriculture, fisheries, aquaculture, forestry, and biosecurity in NSW. The Department of Primary Industries have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Department of Primary Industries are considered relevant persons and have been consulted with.
Gulaga and Biamanga Joint Authority	Located on the far south coast of NSW, Biamanga and Gulaga National Parks contain places sacred to the Yuin people, such as Mumbulla Mountain and Gulaga Mountain. The parks are jointly managed by the Aboriginal owners and the NSW National Parks and Wildlife Service, part of the Office of Environment and Heritage. The two boards of management have a majority of Aboriginal owners along with community and NPWS representation. The Gulaga and Biamanga Joint Authority have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Gulaga and Biamanga Joint Authority are considered relevant persons and have been consulted with.

Relevant Person	Justification
New South Wales National Parks and Wildlife Service (**NSW NPWS**)	NSW NPWS manages protected areas which play a critical role in protecting biodiversity, as well as natural and cultural heritage in parks. NPWS create management documents for the purpose of protection, preservation and regeneration of parks and their values including the safeguard human life and property, protection of Aboriginal sites and assets and the promotion of conservation and biodiversity within the parks. The NSW NPWS have interests in the various environmental receptors the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the NSW NPWS are considered relevant persons and have been consulted with.
Transport for NSW	Transport for NSW manages roads and waterways to deliver safe and efficient transport systems in NSW. This includes commercial boating in the marine and coastal environments. Transport for NSW have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. Transport for NSW is identified as the Control Agency for any oil spill that may enter coastal waters of NSW. It is the owner of the 'NSW State Waters marine oil and chemical spill contingency plan' As such, Transport NSW are considered relevant persons and have been consulted with.
Regulation 11A(1)(c): The Department of the responsible State Minister, or the responsible Northern Territory Minister	
Not applicable as the Otway Basin 3D MC MSS is not within State waters.	
Regulation 11A(1)(e): Any other person or organisation that the titleholder considers relevant	
None identified to date	

5.4.5.2.2 Relevant Person Identification under Regulation 11A(1)(d)

As stated by Justice Bromberg in the Primary Decision, the description of a relevant person given by (d) can raise substantial complexity. To address this complexity, this identification process has relied on the comprehensive identification of values and sensitivities within the EMBA (**Section 4**) and conducting an evaluation to discover possible intersections with the functions, interests and activities of people or organisations. In accordance with Section 6 of the Guidance Document, TGS has used a range of "*processes for identification of relevant persons*" that provides for "*sufficiently broad capture of ascertainable persons and organisations who may have their functions, interests or activities affected or that may be affected by the activity*".

TGS adopted the following processes when identifying relevant persons, which are consistent with the expectations set out in the Guidance Document. These are considered appropriate for the purpose of identifying the universe of relevant persons whose functions, interests or activities are associated with the environmental values and sensitivities in the EMBA:

- Publication in appropriate media formats to facilitate the process of self-identification of relevant person(s) (discussed further below);
- Searches of publicly available information, including, but not limited to, government databases and registers, web searches for background information on functions, interests or activities;
- Industry and expert knowledge and experience (including previous work history, professional networks);
- The use of other EPs associated with seismic surveys which have similar risks and impacts as the proposed Seismic Survey; and
- Utilisation of advice from relevant persons who may know of other persons or organisations that may be considered relevant, including through discussions with organisations representing traditional owner groups and workshops with nearby traditional owner groups.

After developing a comprehensive list of relevant persons using the above processes, was undertaken to ascertain the starting point of consultation requirements.

As outlined above, the consultation programme has provided for self-identification of relevant person(s) through public notification processes. It is anticipated the publication of the EP on NOPSEMA's website, TGS' website, national, state-wide (multiple states) and regional newspapers will further identify relevant persons who can be considered as self-identified via the public notifications process (see **Section 5.6** for further details).

Following the self-identification of a relevant person through this publication process, TGS will assess the information provided by the potentially relevant person to determine whether their functions, interests and activities, are likely to overlap the OA or EMBA and confirm they are relevant. If this assessment shows the person(s) is considered relevant for the purpose of this EP or it remains unclear whether they are relevant, then consultation will continue with them to confirm relevancy and ascertain the potential impacts and risks to their function, interest or activity, and the development of control measures to address those impacts and risks.

Following the process outlined above, and applying the descriptions detailed in **Section 5.4.5.1**, **Table 39** lists the relevant persons described by regulation 11A(1)(d). The 'Justification' column of **Table 39** provides details on the functions, interests or activities of the relevant person and why they are considered relevant for the Otway Basin 3D MC MSS. **Table 39** provides an outline of those person(s) who are considered relevant under (d), along with a justification as to why they are considered relevant under the Environment Regulations. A full report on the consultation undertaken with the relevant persons is included within **Appendix H**, as per the requirements of Regulation 16(b).

Only those relevant persons confirmed as relevant for the purpose of this EP are listed in **Table** 39. All persons engaged with by TGS, including those no longer considered relevant are listed in **Appendix G**.

Table 39 Regulation 11A(1)(d) Relevant Person Identification

Relevant Person	Justification
Traditional Owner Groups	
Aboriginal Heritage Council Tasmania (Report to AHT) (TAS)	The statutory Aboriginal Heritage Council was established in 2017 under the Aboriginal Heritage Act 1975. It is an independent body who provides advice and recommendations to the Minister for Aboriginal Affairs, the Director of National Parks and Wildlife, land managers and owners and other stakeholders on the protection and management of Aboriginal heritage in TAS. All members of the Council are from the TAS Aboriginal community and have experience and knowledge of Aboriginal heritage management. The Aboriginal Heritage Council of Tasmania have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Aboriginal Heritage Council of Tasmania are considered relevant persons and have been consulted with.
Aboriginal Land Council of Tasmania (TAS)	The Aboriginal Land Council of Tasmania is the statutory body, established by law to own returned land on behalf of TAS' Aboriginal Community. The Aboriginal Lands Act (1995) sets out the establishment, election, and purpose of the Aboriginal Land Council of TAS. The Land Council is governed by a board of eight Aboriginal people, elected in a TAS Electoral Commission election that is open to all people on the Aboriginal electors roll. The Council includes two representatives from each of the South, North and North West regions and one each from truwana/Cape Barren Island and Flinders Island. The Aboriginal Land Council of Tasmania have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Aboriginal Land Council of Tasmania are considered relevant persons and have been consulted with.

Relevant Person	Justification
Aboriginal Launceston (TAS)	Aboriginal Launceston is a website run by two educators for teachers and anyone interested in TAS' Aboriginal past. The website was set up to help navigate the challenges and demands faced by teachers who are required to implement First Nations histories and cultures content in their programs. The website, through the two primary educators of the website, seek to provide information that is aligned to First Nations topics in the Australian Curriculum. Aboriginal Launceston has interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Aboriginal Launceston are considered relevant persons and have been consulted with.
Bega Local Aboriginal Land Council (NSW)	The Bega Local Aboriginal Land Council is one of 120 similar organisations that comprise a network that covers the NSW landmass. The Bega LALC mandated area (~5900sq.km) is approximately 35 kilometres north south and 180 kms east to west. The Bega Local Aboriginal Land Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Bega Local Aboriginal Land Council are considered relevant persons and have been consulted with.
Bodalla Local Aboriginal Land Council (NSW)	The Bodalla Local Aboriginal Land Council is one of 120 similar organisations that comprise a network that covers the NSW landmass. The Bodalla Land Aboriginal Land Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Bodalla Land Aboriginal Land Council are considered relevant persons and have been consulted with.
Bunurong Land Council Aboriginal Corporation (VIC)	Bunurong Land Council Aboriginal Corporation are a Traditional Owner organisation that represent the Bunurong people of the South-Eastern Kulin Nation. It is the Registered Aboriginal Party for and on behalf of Bunurong People. The Bunurong Land Council Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Bunurong Land Council Aboriginal Corporation are considered relevant persons and have been consulted with.
Burrandies Aboriginal Corporation (South Australia)	The Burrandies Aboriginal Corporation has been serving the Indigenous Community of the South East of South Australia since 1999. The Burrandies Aboriginal Corporation formally recognises the partnership between Burrandies and the South East Aboriginal Focus Group (traditional custodians of the South East of South Australia) and acknowledges that the Lartara-wirkeri cultural governance framework will guide how Burrandies Aboriginal Corporation undertakes all business, and especially any and all business undertaken with the South East Aboriginal Focus Group and on behalf of the South East Aboriginal Focus Group. The Burrandies Aboriginal Corporation have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Burrandies Aboriginal Corporation are considered relevant persons and have been consulted with.
Cape Barren Island Aboriginal Association Incorporated (TAS)	Cape Barren Island Aboriginal Association Incorporated was established in 1972 and is overseen by an Aboriginal Management Committee. The Cape Barren Island Aboriginal Association Inc have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Cape Barren Island Aboriginal Association Inc are considered relevant persons and have been consulted with.
Circular Head Aboriginal Corporation (TAS)	The Circular Head Aboriginal Corporation became incorporated in 1994. It is governed by the Corporations Aboriginal and Torres Strait Islander (**CATSI**) Act. As a registered Aboriginal organisation, CHAC is regulated by the Office of the Registrar of Indigenous Corporations as per the CATSI Act. It represents the Aboriginal people of Circular Head and aims to represent the nine tribes of the north west region. The Circular Head Aboriginal Corporation have interests in receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Circular Head Aboriginal Corporation are considered relevant persons and have been consulted with.

Relevant Person	Justification
Eastern Maar Aboriginal Corporation (VIC)	The Eastern Maar Aboriginal Corporation manages native title rights for the Eastern Maar Peoples. It is also the Registered Aboriginal Party for Eastern Maar Country and is currently negotiating a Recognition and Settlement Agreement under the Traditional Owner Settlement Act 2010. The Eastern Maar are Traditional Owners of south-western VIC. Their land extends as far north as Ararat and encompasses the Warrnambool, Port Fairy and Great Ocean Road areas. It also stretches 100 m out to sea from low tide and therefore includes the iconic Twelve Apostles. The Eastern Maar Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Eastern Maar Aboriginal Corporation are considered relevant persons and have been consulted with.
Eden Local Aboriginal Land Council (NSW)	The Eden Local Aboriginal Land Council is one of 120 similar organisations that comprise a network that covers the NSW landmass. The Eden Local Aboriginal Council have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Eden Local Aboriginal Land Council are considered relevant persons and have been consulted with.
Elders Council of Tasmania Aboriginal Corporation	The Elders Council of Tasmania Aboriginal Corporation was incorporated in 2000. It provides advice and support to support the needs of Aboriginal Elders in relation to health and living standards and assist in maintaining unity in cultural links. The Elders Council of Tasmania Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Elders Council of Tasmania Aboriginal Corporation are considered relevant persons and have been consulted with.
First Nations of the South-East (South Australia)	South Australian Native Title Services Ltd (**SANTS**) is the Native Title Service Provider for South Australia, primarily funded by the National Indigenous Australians Agency. It is a not-for-profit company assisting Aboriginal people in South Australia to gain recognition and to protect their native title rights and interests. It delivers a range of services to Aboriginal Nations to achieve their social, cultural, and economic aspirations. The First Nations of the South-East are located in the south-east of Australia near the VIC border and covers an approximate area of 19,681 km^2. The First Nations of the South East have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the First Nations of the South-East are considered relevant persons and have been consulted with.
First Tasmanians Aboriginal Corporation (TAS)	The First Tasmanians Aboriginal Corporation was registered in September 2021. As of 19 April 2023, it had 258 members. Objectives of the Corporation include: advocating to government, media and other groups, matters of interest to its members including the history, culture and needs of the Aboriginal people in TAS and to revive, support and protect places, areas and objects of particular significance for Aboriginal and Torres Strait Islander peoples. The First Tasmanians Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the First Tasmanians Aboriginal Corporation are considered relevant persons and have been consulted with.

Relevant Person	Justification
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC (VIC)	The Gunaikurnai Land and Waters Aboriginal Corporation is the Registered Aboriginal Party that represents the Gunaikurnai people, the Traditional Owners of our Country, as determined by the VIC Aboriginal Heritage Council under the Aboriginal Heritage Act, 2006. It was established in 2007 in preparation for the historic settlement between its people and the State of VIC and was legally recognised by the Federal Court of Australia under the Traditional Owners Settlement Act in 2010. It is the Prescribed Body Corporate for the Gunaikurnai people and claim area, as outlined in the agreement, providing joint management of 10 parks and reserves within the State. It has a membership of more than 600 Traditional Owners, all of whom have proven their ancestral links to one of 25 Apical Ancestors registered in the Native Title Consent Determination. The Gunaikurnai Land and Waters Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Gunaikurnai Land and Waters Aboriginal Corporation are considered relevant persons and have been consulted with.
Gunditj Mirring Traditional Owners Aboriginal Corporation (VIC)	The Gunditjmara Traditional Owners Community established the Gunditj Mirring Traditional Owners Aboriginal Corporation RNTBC in 2005. It is governed by its members, Gunditjmara traditional owners and native title holders in line with the Corporations (Aboriginal and Torres Strait Islander) Act 2006. The Gunditj Mirring Traditional Owners Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Gunditj Mirring Traditional Owners Aboriginal Corporation are considered relevant persons and have been consulted with.
Karadi Aboriginal Corporation (TAS)	Karadi Aboriginal Corporation is an inclusive Aboriginal Community Controlled Organisation founded in 1988. It provides leadership in the sector and serving Aboriginal people of Southern Tasmania. The Karadi Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Karadi Aboriginal Corporation are considered relevant persons and have been consulted with.
Lia Pootah Aboriginal Corporation (TAS)	The Lia Pootah Aboriginal Corporation represent the Lia Pootah people of TAS. The Lia Pootah Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Lia Pootah Aboriginal Corporation are considered relevant persons and have been consulted with.
melythina tiakana warrana Aboriginal Corporation (TAS)	melythina tiakana warrana Aboriginal Corporation is a registered Aboriginal organisation with the Office of the Registrar of Indigenous Corporations, under the Corporations (Aboriginal and Torres Strait Islander) Act 2006. melythina tiakana warrana members are direct descendants of the Aboriginal Ancestors from the Country of tebrakuna, known as the region of northeast TAS. The melythina tiakana warrana Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the melythina tiakana warrana Aboriginal Corporation are considered relevant persons and have been consulted with.
Merrimans Local Aboriginal Land Council (NSW)	The Merrimans Local Aboriginal Land Council is one of 120 similar organisations that comprise a network that covers the NSW landmass. The Merrimans Local Aboriginal Land Council have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Merrimans Local Aboriginal Land Council are considered relevant persons and have been consulted with.

Relevant Person	Justification
New South Wales Aboriginal Land Council (**NSWALC**)	The NSWALC was established in the 1970s to assist in the fight for land rights. It was formally constituted as a statutory corporation under the New South Wales Aboriginal Land Rights Act in 1983. It is the State's peak representative body in Aboriginal Affairs. It aims to protect the interests and further the aspirations of its members and the broader Aboriginal community. It is the largest member based Aboriginal organisation in NSW. There are 120 LALCs, each constituted over a specific area in NSW. Their boundaries may not align with cultural or traditional associations with Country. LALCs cannot provide certification of Aboriginality. They can, however, choose to confirm the membership of people accepted as adult Aboriginal people who are listed on their membership roll. The NSWALC have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the NSWALC are considered relevant persons and have been consulted with.
Ngarrindjeri Aboriginal Corporation RNTBC (South Australia)	The Ngarrindjeri Aboriginal Corporation RNTBC acts as agent for the native title rights and interests of the Ngarrindjeri people. The determination area for Part A is located east of Adelaide, from Murray Bridge southwest to Cape Jervis and southeast almost to Tintinara. Part B of the determination is on-going. The Ngarrindjeri Aboriginal Corporation RNTBC have interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Ngarrindjeri Aboriginal Corporation RNTBC are considered relevant persons and have been consulted with.
Ngarrindjeri Ruwe Empowered Communities (South Australia)	The Ngarrindjeri Ruwe Empowered Communities works within the Ngarrindjeri Native Title region to work with the Aboriginal and Torres Strait Islander community to implement the Australian Government's Empowered Communities initiative to support the continual empowerment of Aboriginal communities by Aboriginal people. Empowered Communities is an Indigenous designed and led empowerment initiative. The Ngarrindjeri Ruwe Empowered Communities is a backbone organisation that provides the supporting infrastructure to coordinate work among Empowered Communities partner organisations, to progress the Regional Development Agenda and the overall implementation of the model across the region. The Ngarrindjeri Ruwe Empowered Communities have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Ngarrindjeri Ruwe Empowered Communities are considered relevant persons and have been consulted with.
NTSCORP Limited (NSW)	NTSCORP Ltd is the Native Title Service provider for Aboriginal Traditional Owners in the New South Wales, promoting social justice, economic, cultural and social independence for Traditional Owners of the land, seas and waters. NTSCORP Ltd were suggested to TGS as a potentially relevant person during consultation with another relevant person because of their interest within NSW seas. As such NTSCORP Ltd is considered a relevant person and has been consulted with.
Parrdarrama Pungenna Aboriginal Corporation (TAS)	Parrdarrama Pungenna Aboriginal Corporation represents Aboriginal people in the east coast and TAS Peninsula. The Parrdarrama Pungenna Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Parrdarrama Pungenna Aboriginal Corporation are considered relevant persons and have been consulted with.
Six Rivers Aboriginal Corporation (TAS)	Six Rivers Aboriginal Corporation represents Aboriginal people from the mid northern area of TAS. It is a member of The Tasmanian Regional Aboriginal Communities Alliance. The Tasmanian Regional Aboriginal Communities Alliance was developed to provide a mechanism to engage and advise Government at all levels in regard to affairs affecting Aboriginal Tasmanians. The Six Rivers Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Six Rivers Aboriginal Corporation are considered relevant persons and have been consulted with.

Relevant Person	Justification
South Australian Native Title Services (South Australia)	SANTS is the Native Title Service Provider for South Australia, primarily funded by the National Indigenous Australians Agency. It is a not-for-profit company assisting Aboriginal people in South Australia to gain recognition and to protect their native title rights and interests. It delivers a range of services to Aboriginal Nations to achieve their social, cultural and economic aspirations. The SANTS have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the SANTS are considered relevant persons and have been consulted with.
South East Tasmanian Aboriginal Corporation (**SETAC**) (TAS)	The SETAC was incorporated in 1992 and was established in response to community concerns and needs. It facilitates the empowerment of the Aboriginal people of South East TAS to make decisions that affect their lives to ensure a share in Australia's land, wealth, and resources. It aims to empower the Aboriginal people of South East TAS to contribute equitably to the nation's economic, social, and political life, with full recognition of their Indigenous cultural heritage. The SETAC have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the SETAC are considered relevant persons and have been consulted with.
Southern Ocean Protection Embassy Collective (VIC)	Southern Ocean Protection Embassy Collective represent the Gunditjmara Community and Families Members, Traditional Owners of Gunditjmara Sea Country. The Southern Ocean Protection Embassy Collective have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Southern Ocean Protection Embassy Collective are considered relevant persons and have been consulted with.
Tasmanian Aboriginal Centre Inc (TAS)	The Tasmanian Aboriginal Centre Inc is an Aboriginal community organisation developed in the early 1970s and funded by the federal government since 1973. It was incorporated as the Aboriginal Information Service in November 1973 and changed its name to Tasmanian Aboriginal Centre in August 1977, and officially to Tasmanian Aboriginal Corporation in 2016, but still trading as the Tasmanian Aboriginal Centre. It represents the political and community development aspirations of the TAS Aboriginal community. The Tasmanian Aboriginal Centre Inc have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Tasmanian Aboriginal Centre Inc are considered relevant persons and have been consulted with.
Tasmanian Regional Aboriginal Communities Alliance (TAS)	The Tasmanian Regional Aboriginal Communities Alliance was developed to provide a mechanism to engage and advise Government at all levels in regard to affairs affecting Aboriginal Tasmanians. Eligible full members are Aboriginal Community Controlled Organisations in TAS. There are seven member organisations covering TAS and its islands: Circular Head Aboriginal Corporation in the northwest region, Flinders Island Aboriginal Association Inc on Flinders Island, Melythina tiakana warrana Aboriginal Corporation in the northeast, Parrdarrama Pungenna Aboriginal Corporation in the east coast and TAS Peninsula, Six Rivers Aboriginal Corporation in the central and northern coast, South East Tasmania Aboriginal Corporation in the southeast and Weetapoona Aboriginal Corporation on Bruny Island. The Tasmanian Regional Aboriginal Communities Alliance have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Tasmanian Regional Aboriginal Communities Alliance are considered relevant persons and have been consulted with.

Relevant Person	Justification
Wadawurrung Traditional Owners Aboriginal Corporation (VIC)	Wadawurrung Traditional Owners Aboriginal Corporation is the representative body for Wadawurrung Traditional Owners. The Corporation works to support their aspirations and protect Aboriginal Cultural Heritage in accordance with the Victorian Aboriginal Heritage Act 2006. Wadawurrung Traditional Owners Aboriginal Corporation was appointed in May 2009 as a Registered Aboriginal Party under the Victorian Aboriginal Heritage Act 2006. Wadawurrung's Registered Aboriginal Party area covers over 10,000 square kilometres on the western side Melbourne and including the major regional cities of Geelong and Ballarat. This area incorporates the activities of 11 separate local councils. The Wadawurrung Traditional Owners Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Wadawurrung Traditional Owners Aboriginal Corporation are considered relevant persons and have been consulted with.
Wagonga Local Aboriginal Land Council (NSW) (**WLALC**)	WLALC was established in 1984 under the Aboriginal Land Rights Act 1983 (NSW). The Wagonga Local Aboriginal Land Council Board advocates for greater recognition of traditional fishing rights and sees this as a fundamental custodial right. The WALAC have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the WALAC are considered relevant persons and have been consulted with.
Weetapoona Aboriginal Corporation (TAS)	The weetapoona Aboriginal Corporation is a group of Tasmanian Aboriginal people from the Channel and Bruny Island who strive to protect land with cultural and heritage values and to provide Aboriginal cultural experiences and promote community through providing opportunities for TAS Aboriginal people. It is a member of the Tasmanian Regional Aboriginal Communities Alliance. The Weetapoona Aboriginal Corporation have interests in receptors that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Weetapoona Aboriginal Corporation are considered relevant persons and have been consulted with.
Commonwealth Commercial Fishing	
Australian Southern Bluefin Tuna Industry Association (**ASBTIA**)	The ASBTIA represents the Australian SBT industry. SBT catch overlaps with the EMBA. Furthermore, during consultation, TGS were informed that SBT fishers may shift focus to waters of Bass Strait towards the OA. As such, ASBTIA are considered relevant persons and have been consulted with.
Bass Strait Central Zone Scallop Fishery	This fishery operates in the Bass Strait above TAS and extends from the VIC/NSW border, around southern Australia to the VIC/South Australia border. The fishery is between the VIC and TAS scallop fisheries that lie within 20 nm of their respective coasts. Fishers need to hold statutory fishing rights allocated by AFMA to fish in the Bass Strait Central Zone Scallop Fishery. The Bass Strait Central Zone Scallop Fishery has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Bass Strait Central Zone Scallop Fishery are considered relevant persons and have been consulted with.
Commonwealth Fisheries Association (**CFA**)	The CFA is non-profit organisation and is the peak body representing the collective rights, responsibilities, and interests of a diverse commercial fishing industry in Commonwealth-regulated fisheries. CFA and the fisheries they represent have the potential to be impacted by various activities associated with the Otway Basin 3D MC MSS. As such, CFA are considered relevant persons and have been consulted with.
Seafood Industry Australia (**SIA**)	SIA is the national body representing the Australian seafood industry as a whole. Members are from the wildcatch, aquaculture and post-harvest sectors of the Australian seafood industry. It provides services to influence Government decisions, to act as a national industry voice, to provide a marketing and communications centre to ensure the growth of the Australian seafood industry. Various commercial fisheries overlap with either the OA or the wider EMBA. As such, SIA are considered relevant persons and have been consulted with.

Relevant Person	Justification
Small Pelagic Fishery Industry Association (**SPFIA**)	SPFIA represents the interests of Commonwealth-licensed operators in the Small Pelagic Fishery. The Small Pelagic Fishery extends from the Queensland/New South Wales border, typically outside 3 nm, around southern Australia to a line at latitude 31° south (near Lancelin, north of Perth). The fishery is divided into two sub areas, east and west of latitude 146°30' due to evidence of separate stocks both east and west of TAS for jack mackerel, blue mackerel and redbait. The waters targeted by the SPFIA overlap with the OA and wider EMBA. As such, SPFIA are considered relevant persons and have been consulted with.
South East Trawl Fishing Industry Association (**SETFIA**)	SETFIA represents the interests of Commonwealth-licensed trawl fishermen in the South East Trawl Fishery and the East Coast Deepwater Trawl Sector (**ECDTS**). SETFIA is predominately a supply-based organisation but has many marketing members. One of its aims is to promote environmental stewardship and self-management and improve on-the-water practices. Commercial managed fisheries represented by SETFIA overlap with the OA and wider EMBA. As such, SETFIA are considered relevant persons and have been consulted with.
Southern Rock Lobster Limited	Southern Rock Lobster Limited's primary function is to facilitate a process to guide expenditure of Research and Development levy funds independently collected from industry by State Government agencies and leveraged via the Fisheries Research and Development Corporation. SRL's members are the South Australian Rock Lobster Advisory Council Inc (**SARLAC**), the Tasmanian Rock Lobster Fishermen's Association (**TRLFA**), the Victorian Rock Lobster Association (**VRLA**) and the Australian Southern Rock Lobster Exporters Association (**ARLEA**). Waters targeted by southern rock lobster fishers overlap with the OA and EMBA. As such, Southern Rock Lobster Limited are considered relevant persons and have been consulted with.
Southern Shark Industry Alliance Inc. (**SSIA**)	The SSIA represents interests of its Commonwealth-licenced shark gillnet and shark hook members in the Gillnet Hook and Trap Fishery. Commercial catch for the Gillnet Hook and Trap Fishery has been identified within the OA and wider EMBA. As such, SSIA are considered relevant persons and have been consulted with.
Tuna Australia (ETBF Industry Association)	Formed in 2016, Tuna Australia is the industry association representing statutory fishing right holders, fishing companies, fish processors and sellers, and associate members of the Eastern and Western Tuna and Billfish fisheries of Australia (ETBF/WTBF). Members catch more than 4,000 tonnes of tuna from Australian waters each year. Tuna catch overlaps with the EMBA. Furthermore, during consultation, TGS were informed that tuna fishers may shift focus to waters of Bass Strait towards the OA. As such, ASBTIA are considered relevant persons and have been consulted with.
Victoria Commercial Fishing	
A B Hunter Fishing Pty Ltd	A B Hunter Fishing Pty Ltd are a small commercial boating outfit located in Lakes Entrance, VIC. A B Hunter Fishing Pty Ltd has commercial interests that overlap the OA and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, A B Hunter Fishing Pty Ltd are considered relevant persons and have been consulted with.
Abalone Council Victoria	Abalone Council Victoria is the peak body representing interests of abalone divers, quota holders and processors in the VIC wild harvest abalone fishery. Abalone Council Victoria was established to lead and manage commercial stakeholders to secure a financially viable, environmentally sustainable, progressive and growing abalone industry. The Abalone Council Victoria has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Abalone Council Victoria are considered relevant persons and have been consulted with.

Relevant Person	Justification
Abalone Victoria Central Zone	Abalone Victoria Central Zone represent the interests of Abalone Central Zone entitlement holders on operational fishery management matters. It promotes the development of a unified and coordinated approach to operational fishery management matters by Abalone Central Zone entitlement holders and contributes to the sustainable, responsible and efficient use of the Abalone Central Zone resource. The Abalone Victoria Centra Zone has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Abalone Victoria Central Zone are considered relevant persons and have been consulted with.
Apollo Bay Fishermen's Cooperative	The Fishermen’s Co-Op was started at Apollo Bay over seventy years by local fishermen to find markets for produce from the Bass Strait including abalone, scallops, snapper, flake (or gummy shark) and Southern Rock Lobster (crayfish). It continues to support local fishermen. The Apollo Bay Fisherman’s Cooperative has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Apollo Bay Fisherman's Cooperative are considered relevant persons and have been consulted with.
Eastern Zone Abalone Industry Association (**EZAIA**)	The EZAIA is a wild catch abalone industry sector that operates in the Mallacoota region of VIC. In the Eastern Zone, there are 23 licenses which are allocated 460 quota units. The EZAIA has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the EZAIA are considered relevant persons and have been consulted with.
Seafood Industry Victoria (**SIV**)	SIV was formed in 1989 and is a not-for-profit, non-government organization, founded and funded by professional fishers and fish processors. Fishing and post-harvest sector Associations also contribute financially as SIV members. SIV members include harvesters, processors, wholesalers, retailers, and exporters of VIC seafood. SIV also represents 12 Professional Associations: Abalone Victoria (Central Zone), Apollo Bay Fishermen’s Co-op, Corner Inlet Fisheries Habitat Associations, Eastern Victoria Sea Urchin Divers Association, Goulburn River Trout Pty Ltd, Lakes Entrance Fishermen’s Co-op, Melbourne Seafood Centre, San Remo Fishermens Co-op, SeaGen Aquaculture, Southern Ocean Mariculture and Yumbah Narrawong Pty Ltd. The SIV has commercial fishing interests that overlap the OA and wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the SIV are considered relevant persons and have been consulted with.
Victorian Scallop Fisherman’s Association Inc.	The Victorian Scallop Fishermen’s Association Inc. are a collective of the Scallop Fishing Families and associated support work force based in Lakes Entrance, VIC. The waters of the VIC Scallop fishing zone extend out 20 nautical miles, offshore from the high tide water mark, excluding the bays and inlets along the coastline where commercial fishing for scallops is prohibited. The Victorian Scallop Fishermen’s Association Inc represents the interests of scallop fishermen operating within Australia’s south east waters. Members hold entitlement to operate within the Bass Strait Central Zone Scallop Fishery, the Victorian Scallop Fishery and the Tasmanian Scallop Fishery. The Victorian Scallop Fisherman’s Association Inc has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Victorian Scallop Fisherman’s Association are considered relevant persons and have been consulted with.

Relevant Person	Justification
Western Abalone Divers Assn (Abalone Western Zone)	There are 71 abalone fishery access licences in the VIC Abalone Fishery, which is subdivided into three management zones. The licences are distributed across the three management zones, with 14 in the Western Zone, 34 in the central zone and 23 in the Eastern Zone. This means a maximum of 71 divers can operate on any particular day. Some divers harvest abalone on behalf of more than one licence holder and some holders own more than one licence. The Western Abalone Divers Association has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Western Abalone Divers Association are considered relevant persons and have been consulted with.
Tasmania Commercial Fishing	
Scallop Fisherman's Association of Tasmania Inc (**SFAT**)	SFAT actively promotes and protects the best interests of scallop fishermen and processors and negotiates management and season arrangements with the TAS government, DPIPWE and AFMA. SFAT also monitors season harvesting and plays an on-going role in assisting industry members to maximise returns on a sustainable basis as well as regular laboratory testing of scallops to ensure that they are always safe for human consumption. The SFAT has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, SFAT are considered relevant persons and have been consulted with.
Superfresh Scallops	Superfresh Seafoods, previously known as Allan Barnett Fishing Company, is a scallop processing business in the small fishing town of Bridport, TAS. It is also known as Superfresh Scallops. Superfresh Scallops has commercial fishing interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Superfresh Scallops are considered relevant persons and have been consulted with.
Tasmanian Rock Lobster Fisherman's Association (**TRLFA**)	The TRLFA is the peak body in TAS for the commercial rock lobster fishery. The primary role of the TRLFA is to promote and represent the best interests of its members and the commercial industry as a whole. The TRLFA has commercial fishing interests that overlap the OA and wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, TRLFA are considered relevant persons and have been consulted with.
Tasmanian Seafood Industry Council (**TSIC**)	TSIC is the peak body representing the interests of wild capture fishers, marine farmers, and seafood processors in TAS. The Council works in conjunction with the industry sector groups to ensure that all sectors of industry are ecologically sustainable and make an ongoing economic contribution to the TAS economy, particularly in regional areas. TSIC has commercial fishing interests that overlap the OA and wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, TSIC are considered relevant persons and have been consulted with.
South Australia Commercial Fishing	
South Australian Rock Lobster Advisory Council Inc. (**SARLAC**)	SARLAC exists to promote the interests of the South Australian Rock Lobster Industry and is governed by a Board comprising of industry leaders from each Zone together with an independent Chairperson. It works closely with grass-roots industry participants through close association with the South Eastern Professional Fishermen's Association Inc (**SEPFA**) in the Southern Zone Fishery and also the South Australian Northern Zone Rock Lobster Fishermen's Association Inc. (**SANZRLFA**) in the Northern Zone Fishery. SARLAC takes a proactive approach SANZRLFA towards stakeholder engagement to ensure best practice in fishery management. SARLAC have fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, SARLAC are considered relevant persons and have been consulted with.

Relevant Person	Justification
South Australian Rock Lobster Fishery	The South Australian rock lobster fishery is based on the capture of southern rock lobster. The fishery is separated into 2 zones: the South Australian Northern Zone Rock Lobster Fishermen's Association Inc. (**SANZRLFA**) in the northern zone and the South Eastern Professional Fishermen's Association Inc (**SEPFA**) the southern zone. The South Australian Rock Lobster Fishery have fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the South Australian Rock Lobster Fishery are considered relevant persons and have been consulted with.
South Eastern Professional Fishermen's Assn Inc (**SEPFA**)	SEPFA represents the interests of the South Australian Southern Zone Rock Lobster Fishery and is governed by a Committee of industry leaders. SEPFA have fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, SEPFA are considered relevant persons and have been consulted with.
Wildcatch Fisheries South Australia Inc.	Wildcatch Fisheries South Australia Inc. represent the commercial wildcatch fisheries in South Australia - composed of 14 distinct fisheries, with over 800 licence holders. Wildcatch Fisheries South Australia Inc have fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Wildcatch Fisheries South Australia Inc are considered relevant persons and have been consulted with.
Recreational Fishing	
Australian Fishing Trade Association	The Australian Fishing Trade Association is the peak body representing Australia's fishing tackle industry. It was formed in the early 1980s by independent wholesalers/distributors and manufacturers of fishing tackle and associated products in Australia. It is an Australian trade association that promotes public angling and members of the association. The Australian Fishing Trade Association have fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Australian Fishing Trade Association are considered relevant persons and have been consulted with.
Australian Recreational Fishing Foundation (**ARFF**)	The ARFF is a not-for-profit organisation with a voluntary Board of recreational fishing strategists. It is the peak representative body to the Australian Federal Government and is a partnership between State peak fishing bodies, representative organisations and fish habitat groups. The ARFF have recreational fishing interests in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the ARFF are considered relevant persons and have been consulted with.
RecFish SA	RecFish SA is the nationally recognised peak body for the 360,000 recreational fishers in South Australia. They undertake fish stocking, citizen science, habitat enhancement and fishing clinics, to benefit recreational fishers. Membership is made up of individuals and organisations, including fishing clubs and associations, regional Recreational Fisheries Committees, coastal progress associations, and recreational fishing related businesses. RecFish SA have interests in recreational fisheries in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, RecFish SA are considered relevant persons and have been consulted with.
Tasmanian Association for Recreational fishing (**TARFish**)	TARFish is an independent peak body representing the interests of recreational marine fishers in TAS. TARFish have interests in recreational fisheries in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, TARFish are considered relevant persons and have been consulted with.

Relevant Person	Justification
Victorian Recreational Fishing Peak Body (**VRFish**)	VRFish was established after implementing recommendations outlined by a Ministerial Committee 'Recreational Fishing Peak Body Working Group' in 1995. It was established that there was a need for a single independent body to unite and represent the interests of all of VIC's recreational fishers. The Working Group determined that the peak body must be representative of fishers who engage in all forms of non-commercial fishing (except traditional aboriginal fishing). This includes sport fishing, recreational fishing, underwater fishing, subsistence fishing and bait gathering. VRFish have interests in recreational fisheries in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, VRFish are considered relevant persons and have been consulted with.
Ports and Shipping	
Flinders Ports	Flinders Ports is a private port operator and South Australia's leading port operator with seven ports located at Port Adelaide, Port Lincoln, Port Pirie, Thevenard, Port Giles, Wallaroo and Klein Point. It is based in Port Adelaide in South Australia. It is responsible for the safe and efficient operation of ports and the protection of the environment in which the ports operate. Flinders Ports have interests in the waters of the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Flinders Port are considered relevant persons and have been consulted with.
Port of Melbourne Corporation (**PoMC**)	The PoMC is a statutory body established by the VIC Government to develop and manage the Port of Melbourne, Australia's busiest container port. The Port of Melbourne serves as a vital freight hub for Australia, including southern NSW, South Australia and TAS. The PoMC have interests in the waters of the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the PoMC are considered relevant persons and have been consulted with.
Ports Victoria	Ports Victoria (formerly known as Victorian Ports Corporation Melbourne) is a statutory authority created by the Victorian Government in 2016 following the successful completion of the lease of the commercial operations of the Port of Melbourne. Ports Victoria's responsibilities include the management of commercial shipping in Port Phillip, safe navigation in the port waters of the port of Melbourne, waterside emergency and marine pollution response, and the management of Station Pier as VIC's premier cruise shipping facility. The critical work of the Harbour Master also resides with Ports Victoria. The Ports Victoria have interests in the waters of the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Ports Victoria are considered relevant persons and have been consulted with.
TasPorts	The Tasmanian Ports Corporation, also known as TasPorts is a state-owned company responsible for eleven TAS ports and the Devonport Airport. Port facilities under the central authority of Tasports are operated at the ports of Bell Bay, Burnie, Currie, Devonport, Grassy, Hobart, Lady Barron (Flinders Island), Smithton, Stanley, Strahan, Triabunna and Whitemark (Flinders Island). The TasPorts have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the TasPorts are considered relevant persons and have been consulted with.
Academic and Research Organisations	
Australian Institute of Marine Science (**AIMS**)	The AIMS is a tropical marine research centre located primarily at Cape Ferguson in the locality of Cape Cleveland, City of Townsville Queensland, Australia. Their research directly benefits management agencies, marine industries, and coastal communities throughout Australia. It is considered that AIMS is a relevant person due to the interest in the marine environment in Australian national waters which potentially intersect with the Otway Basin 3D MC MSS.

Relevant Person	Justification
Blue Whale Study Inc	The Blue Whale Study Inc conducts ecological research on blue whales and their upwelling habitats in southern Australia. They work alongside local, state and federal governments, NGOs, universities, industry and other research institutions for the conservation of blue whales. The study area of The Blue Whale Study Inc intersects with the EMBA, while their focus study species (the blue whale/pygmy blue whale) also utilises the waters of the OA. As such, the Blue Whale Study Inc are considered relevant persons and have been consulted with.
Centre for Whale Research	A non-government organisation promoting cetacean related research. The Centre of Whale Research has an interest in the marine mammals associated with the EMBA (and wider) which may be impacted by the Otway Basin 3D MC MSS.
Deakin University - School of Life and Environmental Sciences	The Deakin University - School of Life and Environmental Sciences has research areas focussed on marine biology, fisheries and aquaculture. It has four campuses across Melbourne, Geelong and Warrnambool. Students attending Deakin University may utilise waters of the EMBA for their studies and as such Deakin University are considered a relevant person and have been consulted with.
Great Australian Bight Right Whale Study	The Great Australian Bight Right Whale Study researches the endangered and migratory southern right whale species for conservation management. Research includes population biology, photo identification and underwater acoustics at Head of Bight and Fowlers Bay in the Great Australian Bight, South Australia. The study area of the Great Australian Bight Right Whale Study intersects with the EMBA, while their focus study species (the southern right whale) also utilises the waters of the OA. As such, the Great Australian Bight Right Whale Study are considered relevant persons and have been consulted with.
University of Tasmania (**UTAS**) - Institute for Marine and Antarctic Studies (**IMAS**)	The IMAS is a teaching and research institute of the University of TAS in Hobart, Tasmania. IMAS was established in 2010, building upon the university's partnership with CSIRO Oceans and Atmosphere and the Australian Antarctic Division in cooperative Antarctic research and Southern Ocean research. The Institute aims "*to improve understanding of temperate marine, Southern Ocean, and Antarctic environments, their resources, and their roles in the global climate system through research, education, and outreach*". Students attending UTAS may utilise waters of the EMBA for their studies and as such UTAS IMAS are considered a relevant person and have been consulted with.
Oil and Gas Industry	
3D Oil	The formation of 3D Oil Limited was motivated by an initial focus on the Gippsland Basin, one of the more prolific oil and gas producing region in Australia. 3D Oil currently has interests in exploration permits in the offshore Gippsland and Otway Basins of South East Australia, as well as the significant new petroleum province within the Bedout Sub-basin of the Northwest Shelf. As such, 3D Oil are considered a relevant person and have been consulted with.
Beach Energy	Beach Energy Limited is an Australian oil and gas exploration and production company based in Adelaide, South Australia. It has onshore and offshore oil and gas production in five basins across Australia and New Zealand, including In the VIC Otway Basin and Bass Basin. As such, Beach Energy are considered a relevant person and have been consulted with.
CGG	CGG is a Geoscience company providing geological, geophysical and reservoir capabilities to a broad base of customers primarily from the global oil and gas industry. CGG has interested in the Otway Basin and as such are considered a relevant person and have been consulted with.

Relevant Person	Justification
Conoco Phillips	Conoco Phillips is an American multinational corporation engaged in hydrocarbon exploration and production based in the Energy Corridor district of Houston, Texas. It is currently developing an EP to undertake exploration activities in offshore permits VIC/P79 and T/49P located in Commonwealth waters of the Otway Basin. These permits like in proximity to the OA and as such, Conoco Phillips are considered relevant persons and have been consulted with.
Cooper Energy	Cooper Energy supply gas for domestic and industrial use in South-east Australia from operations at offshore VIC in the Gippsland Basin (Sole gas field) and Otway Basin (Casino, Henry and Netherby gas fields). As such, Cooper Energy are considered relevant persons and have been consulted with.
Offshore Infrastructure	
Subco Pty Ltd	Subco Pty Ltd are undersea cable specialists with a network of cables extending from Australia to the Middle East and beyond. The Indigo Central submarine cable, off southern Australia, is owned by a consortium which Subco Pty Ltd is a member of. The Indigo Central is an advanced 4,850 km long cable system offering direct, low latency connectivity from Sydney to Perth, Australia. The Indigo Central submarine cable system passes through the OA. As such, Subco Pty Ltd are considered relevant persons and have been consulted with.
Superloop Ltd	Superloop Limited operates as a telecommunications infrastructure company. The company designs, constructs, and operates underground fibre-optic cable network. It co-owns and manages the Indigo Central submarine cable system, which is located within the OA. As such, Superloop Ltd are considered relevant persons and have been consulted with.
Recreation and Tourism	
Discover Tasmania	Discover Tasmania, also known as Tourism Tasmania, is a State Authority that is focused on brand management and generating demand for leisure visitors to the state. Discover Tasmania have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Discover Tasmania are considered relevant persons and have been consulted with.
Diving Industry of Victoria Association Inc	The Diving Industry Association of Victoria was established to promote the sport of diving in VIC and to support Victorians involved in the diving industry. It liaises with Government bodies and authorities on marine conservation, environmental issues and other matters that affect the diving industry and the sport of diving in VIC. The waters targeted by members of the Diving Industry Association of Victoria intersect the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Diving Industry of Victoria Association Inc are considered relevant persons and have been consulted with.
King Island Boat Club	The King Island Boat Club is located on Grassy Harbour, King Island and provides educational, recreational and competitive water sports opportunities around King Island, including the annual Queenscliff to Grassy yacht race. The King Island Boat Club has interests within the coastal and marine areas around King Island which overlap with the EMBA. As such, the King Island Boat Club is considered a relevant person and has been consulted with.
King Island Tourism	King Island tourism looks to promote tourism on King Island through marketing and brand management. King Island Tourism have interests in a variety of the receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, King Island Tourism are considered relevant persons and have been consulted with.

Relevant Person	Justification
Ocean Racing Club of Victoria (**ORCV**)	The ORCV was formed as the Cruising Yacht Club of VIC by a group of yachtsmen in 1949 and renamed in 1972. The ORCV was incorporated in 1986. The club organises and develops ocean races in VIC waters focusing specifically on the needs of ocean racers. It is a non-profit organisation, which draws its membership from major yacht clubs in VIC. The ocean races hosted by ORCV traverse the EMBA in proximity to the OA. As such, ORCV are considered relevant persons and have been consulted with.
Scuba Divers Federation of South Australia, Inc	Scuba Divers Federation of South Australia, Inc brings South Australia's recreational scuba diving shops, clubs, related NGOs and individual divers, snorkellers and free divers together to advocate for the enjoyment and preservation of South Australia's marine waters. It advises its stakeholders on all diving related matters. The waters targeted by members of Scuba Divers Federation of South Australia inc intersect with the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Scuba Divers Federation of South Australia are considered relevant persons and have been consulted with.
SCUBA Divers Federation of Victoria	SDF VIC is the peak body for recreational scuba divers, free-divers and snorkellers in VIC. It is an association of scuba diving shops, clubs, related NGOs and individuals from across the State. The waters targeted by members of Scuba Divers Federation VIC intersect with the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Scuba Divers Federation VIC are considered relevant persons and have been consulted with.
Southern Coast Charters (King Island Dive Adventure)	Southern Coast Charters is a fishing charter service operating out of Port Fairy, VIC. It operates charters for tuna and deep sea game fishing off the coast of VIC. The waters targeted by Southern Coast Charters intersect with the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Southern Coast Charters are considered relevant persons and have been consulted with.
Tourism Industry Council of Tasmania	The Tourism Industry Council Tasmania is a not-for-profit organisation and is the peak body for TAS's tourism industry. It provides advocacy and leadership to the TAS tourism industry. The Tourism Industry Council of Tasmania have interests in a variety of the receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Tourism Industry Council of Tasmania are considered relevant persons and have been consulted with.
South Australian Tourism Commission (**Tourism SA**)	The South Australian Tourism Commission, also known as the SA Tourism Commission, is an organisation set up by the Government of South Australia to promote tourism in South Australia. Tourism SA have interests in a variety of the receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Tourism SA are considered relevant persons and have been consulted with.
Environmental Conservation Groups	
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (**ANGAIR**)	ANGAIR is an active voluntary group, established in 1969 and based in VIC, dedicated to protecting the indigenous flora and fauna and maintaining the natural beauty of Anglesea and Aireys Inlet and the local environments. The ANGAIR have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the ANGAIR are considered relevant persons and have been consulted with.

Relevant Person	Justification
Apollo Bay Landcare Group	The Apollo Bay Landcare Group is part of Landcare. Landcare is a community-based movement that began in VIC in 1986, when Joan Kirner, then Minister for Conservation, Forests and Lands, and Heather Mitchell, then president of the Victorian Farmers Federation joined forces to create what was then called Land Care. There are currently more than 600 groups working towards the protection and rehabilitation of land, biodiversity and waterways. The Apollo Bay Landcare Group have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Apollo Bay Landcare Group are considered relevant persons and have been consulted with.
Australian Coastal Society Ltd (**ACS**)	The ACS was initiated at the Coast-to-Coast Conference in TAS in 2004 as a means to communicate coastal matters between conferences and where possible take resolutions of the conference to ap propriate levels of government. The South Australian branch of ACS focuses attention on running state coastal conferences and regional workshops. The TAS branch of ACS comprises members from academic, research and community backgrounds who meet regularly to discuss coastal matters statewide and nationally. The VIC branch of ACS is heavily involved in a number of coastal and marine policy reforms happening within VIC, providing representation on a number of working groups and/or providing submissions to key pieces of polices. The ACS have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the ACS are considered relevant persons and have been consulted with.
Australian Conservation Foundation	The Australian Conservation Foundation is Australia's national environmental organisation, launched in 1965 in response to a proposal by the World Wide Fund for Nature for a more co-ordinated approach to sustainability. It is an independent, non-partisan, non-profit organisation focused on advocacy, policy, research and community organising, with a membership of 700,000. The Australian Conservation Foundation have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Australian Conservation Foundation are considered relevant persons and have been consulted with.
Australian Marine Conservation Society	The Australian Marine Conservation Society is an Australian environmental not-for-profit organisation. The key focus of AMCS is to create large marine national parks (marine sanctuaries), sustainable fisheries and protect and recover our threatened ocean wildlife, such as our sharks, seals and whales. There are several AMPs, commercial fisheries, and threatened wildlife of relevance to the OA and EMBA. As such, the Australian Marine Conservation Society are considered relevant persons and have been consulted with.
Beach Patrol 3280	Beach Patrol Australia Inc oversees a network of community beach and street cleaning volunteer groups each originated under and part of the Beach Patrol movement in VIC to help clean beaches, streets and parks. Each group is defined by its suburb, Beach Patrol 3280 is based in Warrnambool. Beach Patrol Australia Inc identified Beach Patrol 3280 as a relevant person. Beach Patrol 3280 have interests in the VIC coastline which overlaps with the EMBA and lies inshore of the OA. As such, Beach Patrol 3280 are considered relevant persons and have been consulted with.

Relevant Person	Justification
Conservation Council of South Australia	The Conservation Council of South Australia, also known as Conservation SA and Conservation Council SA, is an environmental organisation serving as a peak body, representing over 50 member groups, representing over 90,000 individual members, in the state of South Australia. It is an independent, non-profit, and strictly non-party political organisation. It informs the public and government on key environmental issues and participates in government and community processes that seek to restore and protect the natural environment. The Council liaises with industry, government departments, unions, community organisations and all political parties. The Conservation Council of SA have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Conservation Council of SA are considered relevant persons and have been consulted with.
Environment Tasmania	Environment Tasmania was established in 2004 primarily as a Conservation Council. It is the peak group for environment organisations in the state. It is a not-for-profit, non-partisan campaigning organisation, with member groups active on issues ranging from climate change to marine protection. Environment Tasmania have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Environment Tasmania are considered relevant persons and have been consulted with.
Friends of the Bay of Islands Coastal Park	The Friends of the Bay of Islands Coastal Park is part of Landcare. There are currently more than 600 groups working towards the protection and rehabilitation of land, biodiversity and waterways. Friends of the Bay of Islands Coastal Park has interests that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Friends of the Bay of Islands Coastal Park are considered relevant persons and have been consulted with.
International Fund for Animal Welfare (**IFAW**)	The IFAW is one of the largest animal welfare and conservation charities in the world. The organization works to rescue individual animals, safeguard populations, preserve habitat, and advocate for greater protections. The IFAW has interests in environmental receptors that overlap the OA, and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the IFAW are considered relevant persons and have been consulted with.
King Island Landcare Tasmania	The King Island Landcare Tasmania is part of Landcare. There are currently more than 600 groups working towards the protection and rehabilitation of land, biodiversity and waterways. King Island Landcare Tasmania have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill, and as such King Island Landcare Tasmania are considered relevant persons and have been consulted with.
Marine Mammal Foundation	The Marine Mammal Foundation is a not-for-profit scientific and education organisation protecting the marine environment through research, community engagement, and education. Several species of marine mammal have been identified as potentially present within the OA and wider EMBA, and as such, the Marine Mammal Foundation are considered relevant persons and have been consulted with.
Otway Climate Emergency Action Network (**OCEAN**)	OCEAN is an environmental activist group from Apollo Bay and the Otway Ranges. Its main goal is to inform Australians about the impacts of gas exploration in the Otway Basin. OCEAN self-identified to TGS as part of the consultation process. The main focus area of OCEAN includes the OA and wider EMBA. As such, OCEAN are considered relevant persons and have been consulted with.

Relevant Person	Justification
Port Phillip EcoCentre	Port Phillip EcoCentre is a not-for-profit, community-managed environment group located in the corner of St Kilda Gardens, Melbourne. For over 20 years it has provided a base for affiliate groups involved in activities that promote environmental sustainability and community action. The Port Phillip EcoCentre has interests in environmental receptors that overlap the OA, and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Port Phillip EcoCentre are considered relevant persons and have been consulted with.
Surfers for Climate	Surfers for Climate is an Australian charity dedicated to raising awareness on climate change. Surfers for Climate has interests in environmental receptors that overlap the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Surfers for Climate are considered relevant persons and have been consulted with.
Surfrider Foundation Australia	Surfrider Foundation Australia is a registered not for profit sea-roots organisation founded in 1991 dedicated to the protection of Australia's marine waters and beaches through conservation, activism, research and education. Surfrider Foundation Australia self-identified to TGS as part of the consultation process. The Surfrider Foundation Australia has interests in environmental receptors that overlap the OA, and the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, the Surfrider Foundation Australia are considered relevant persons and have been consulted with.
Tasmanian Conservation Trust	Tasmanian Conservation Trust is TAS's oldest non-profit conservation organisation, formed in 1968. The Tasmanian Conservation Trust works to preserve TAS's biodiversity, natural values, built and cultural heritage. The Tasmanian Conservation Trust have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill, and as such, the Tasmanian Conservation Trust are considered relevant persons and have been consulted with.
The Wilderness Society	A non-government organisation advocating conservation and may have functions, interests and activities in the EMBA associated with the biological environment. The Wilderness Society is an Income Tax Exempt Charity across all states/territories in Australia. The Wilderness Society has an interest in a variety of the biological environment receptors in the wider EMBA which may be impacted in the unlikely event of a fuel oil spill. It is considered that the influence of this relevant person is low. ADD MORE – HAVE THEY BEEN CONSULTED WITH?
Warrnambool Coastcare Landcare Network Inc	Warrnambool Coastcare Landcare Network is a volunteer community organisation working to improve biodiversity in Warrnambool and district and advocating for the protection of the natural environment. Warrnambool Coastcare Landcare Network have interests in a variety of the biological receptors in the wider EMBA which may be impacted in the unlikely event of a fuel spill. As such, Warrnambool Coastcare Landcare Network Inc are considered relevant persons and have been consulted with.

TGS acknowledges that new relevant persons can be introduced at any time throughout the duration of the EP and the flexible and adaptive consultation methodology within this EP (**Section 5.5.1**) can accommodate such introductions through the Management of Change process (**Section 10.4.6**).

5.5 Relevant Persons Consultation Programme and Methodology

5.5.1 Overview

The consultation programme has been designed in accordance with the Object of Regulation 3 of the Environment Regulations, which is to ensure that any petroleum activity or greenhouse gas activities carried out in an offshore area is:

a) Carried out in a manner consistent with the principles of ESD as set out in section 3A of the EPBC Act; and

b) Carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable; and

c) Carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level.

As noted in the Guidance Document, the process of preparing an Environment Plan is an iterative one. The design of the consultation programme specifically recognises and accommodates this iterative process, whereby additional information may be received that may require further consultation processes to be undertaken, including with additional relevant person(s). The relevant person consultation programme led by TGS is continuing for the duration of the EP. The consultation programme has and continues to provide a mechanism for information and knowledge exchange between TGS and relevant persons regarding the proposed Otway Basin 3D MC MSS as well as understand the values and sensitivities of each relevant person. TGS has provided the opportunity for relevant persons to ask specific questions, provide feedback, have meetings and transparent, open and honest communications as captured in **Appendix H**. Further, the information exchanged during consultation has provided TGS with an understanding of the potential risks and impacts the Otway Basin 3D MC MSS poses on the functions, interests, and activities of relevant persons. This information has informed TGS' planning and execution of the Otway Basin 3D MC MSS, including development of suitable controls to avoid or mitigate risks and impacts. Consultation with relevant persons also assisted in understanding and developing the methodologies for identifying all relevant persons and providing sufficient information and reasonable timeframes.

Consultation for the Otway Basin 3D MC MSS identified 163 relevant persons which includes government agencies, academic and research organisations, ports and shipping organisations, non-government agencies, fisheries, tourism and recreational groups, traditional owner groups, native title holders, environmental groups, offshore infrastructure companies and petroleum and exploration companies. TGS managed this information throughout the consultation program in a register, which consisted of contact details, date of last activity and a consultation 'status' to indicate whether the relevant person required further contact or not. A summary list of relevant persons that have been contacted as a component of the relevant persons consultation programme for the Otway Basin 3D MC MSS is provided in **Appendix G**.

5.5.1.1 Transparency and Record Keeping

TGS is required to ensure full transparency is maintained during the relevant persons consultation process. This is to allow NOPSEMA to determine whether consultation has been undertaken appropriately and in accordance with the requirements of the Environment Regulations. Environmental Regulations 16(b)(iv) requires TGS to include a copy of the full text of any response that has been submitted by a relevant person, within the final EP. To this end, the unedited versions of all correspondence with all relevant persons that formed part of the relevant person consultation process is provided in **Appendix H.**

In addition to this, where verbal communications between TGS and relevant persons have occurred, meeting minutes and phone records were generated to document the consultation. This documentation of the consultation is consistent with the requirements of the 2011 Explanatory Statement to the Environment Regulations, which states that the summaries included from relevant person consultation should promote transparency of all levels of consultation undertaken. These minutes and phone records have been included within **Appendix I**. Further, there were several information sheets distributed to relevant persons as part of the consultation programme, and these are included within **Appendix J**.

Relevant persons are informed that they may advise TGS that particular information they provide is sensitive and request that information not to be made public. Where such requests are made, TGS ensures that information subject to that request is not made public. TGS has provided this explanation within each of the factsheets that has been disseminated and announced at the commencement of each meeting.

5.5.1.2 Methodology Overview

The consultation program methodology has changed and developed as TGS has incorporated experience, learnings and improvements while consulting with relevant persons. Initially (prior to 2023), the consultation process focused on commercial fishing groups and involved briefings and disseminating an information sheet that provided an overview of the Otway Basin 3D MC MSS and information relevant to commercial fishers. This initial consultation was intended to be generic and provide a high-level overview for the relevant person to decide whether they required more information to assess the possible consequences of the activity on their functions, interests or activities.

Following this initial stage of the consultation, from January 2023 the consultation process expanded broadly to encompass a wide range of relevant persons (as detailed in **Section 5.4.5.2**). Consultation commenced (or continued with the existing commercial fishing groups) with emailing an information sheet that introduced marine seismic surveys and provided an overview of the Otway Basin 3D MC MSS. As with the initial stage, this consultation was also intended to be generic and assist the relevant person to decide whether they required more information to assess the possible impacts of the activity on their functions, interests or activities.

Depending on the response from the relevant person, TGS would then either:

- Follow up with another email or phone call (if no response was received) to ask if the relevant person would like additional information or to meet with TGS and discuss further; or
- Provide additional information as requested and in most cases an offer to meet with TGS to discuss their concerns further.

TGS acknowledged all responses, including those persons that did not consider themselves relevant or requested to be removed from the consultation program.

Where requested and possible, TGS provided the specific information requested for each of the relevant persons. Information requests varied from specific details about the seismic survey operation, e.g. equipment, location (GPS coordinates, shapefiles etc) and timing, to requests for specific control measures to mitigate impacts from certain survey aspects or requests for assistance with related research. TGS experienced some challenges related to timing, where requests for information could not be satisfied as the Environment Plan was still being developed and the survey planning was changing often with new information arriving as a result of consultation or further research.

Allowing the relevant person to specify the information that they consider necessary to assess the possible consequences of the activity ensures that they are actively involved in developing a tailored consultation process. If it was identified that insufficient information was provided in the initial round of consultation, revised and targeted information was developed and provided where required following the Appeal Decision and Guidance Document being released.

This process will also add to the understanding of what level of information specific groups of relevant persons need for future applications, resulting in increased industry knowledge.

5.5.1.3 Providing Sufficient Information to make an Informed Assessment

As detailed within the Guidance Document, information provided to relevant persons must be sufficient to allow an informed assessment of the possible consequences of the activity on the functions, interests, or activities of the relevant person. The level of this information required and provided varied for different relevant persons depending on the degree to which a relevant person is affected and interested.

The consultation programme is an iterative process. Central to this, and as noted in the Guidance Document, the provision of information to relevant persons is also an iterative process. In turn, the iterative process serves to inform the 'decisional choice' that TGS has applied to consultation with relevant persons. This means that the decisional choice for each iteration provides relevant person(s) with finer detail and precision on a case-by-case basis, such that relevant persons consulted have the most appropriate information about the Otway Basin 3D MC MSS as it relates to their own functions, interests or activities, and relevant person(s) are given the best opportunity to outline what information needs they have and have the ability and opportunity to request that from TGS.

For all relevant persons, sufficient information is defined as the provision of information as requested by the relevant person(s), to their satisfaction that concerns and queries have been addressed in good faith, and in a timely fashion to facilitate further discussion and enable relevant persons to disseminate information to their own stakeholder groups. This is further considered as information that provides enough detail and information to enable the relevant persons to understand the proposed activity and determine whether the proposed activities (both planned and unplanned) may impact any of their values, sensitivities, or commercial activities.

Given the broad requirements across relevant persons, sufficient information may require personalised and targeted communications, with multiple (more than two) follow up consultations. An example of targeted communications that TGS has provided to relevant persons is the provision of GPS coordinates of the OA in a Microsoft Excel spreadsheet to commercial fishers so they can copy the coordinates straight into the chart plotting software. This not only makes it easier for the fishers but also avoids any transcription errors.

Likewise, the information sheet distributed to Traditional Owner groups differs to the more general information sheet, so TGS has targeted the audience/relevant persons, and sought feedback from key groups consulted as to whether the information provided was sufficient to meet the needs of informing relevant persons. Information within the correspondence undertaken and phone calls held provided further context of the proposed activities as well as the potential for an unplanned activity to occur (i.e. fuel oil release following the rupture of the vessels fuel tank(s)), and what area of the receiving environment may be impacted should an unplanned activity eventuate (i.e. the area covered by the EMBA).

Information was adapted to incorporate feedback from relevant persons for additional information or no suggestions of additional information that should be included was provided by any of the relevant persons that were asked directly whether the information was appropriate. This also includes multiple attempts by TGS to confirm with relevant persons if the information is adequate and if different information is required. As a result, TGS considers that the information provided as part of the consultation process was sufficient to enable relevant persons to make an informed decision as to whether their values and sensitivities or commercial interests would be impacted from the Otway Basin 3D MC MSS. Providing sufficient information allowed relevant persons to make an informed decision as to whether they wanted to provide feedback on the proposed activity or not. The different information sheets distributed to the relevant persons are provided in **Appendix J**.

In general for the 'inform and seek feedback' level of consultation the information provided was considered to be sufficient in accordance with the notification requirements, under the regulatory requirements and guidelines and TGS's commitment to providing sufficient information for relevant persons to make an informed decision on TGS's proposed activity (**Section 5.1**).

TGS has deemed that a relevant person has been provided sufficient information if through follow up communications there has been no change in the level of decisional choice following each iteration (i.e. no change in the finer detail or precision of information requested by the relevant person(s)) and no further iterations to case-by-case consultation have been deemed necessary.

5.5.1.4 Providing a Reasonable Period to make an Informed Assessment

Regulation 11A(3) states titleholders must provide a "*reasonable period*" for the relevant person to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities so they are able to respond with any concerns (para. 56 of the Appeal Decision). However, no discernible definition as to what is considered a 'reasonable period' to support adequate relevant person feedback is provided in the Environmental Regulations, and it is acknowledged that this is assessed on a case-by-case basis, depending on the corresponding requirements for more detailed (or not) further information and consultation efforts. Thus, the provision of a "reasonable period" is inherently linked to the iterative process described above for providing sufficient information and is accommodated into the overall consultation programme on a case-by-case basis.

All relevant persons were contacted, at a minimum, on two separate occasions. As noted throughout this section, where relevant persons have requested further consultation, this has been accommodated on a case-by-case basis. The timeframes between the initial email communications and follow up communications with relevant persons was highly variable, and thus a generalised time period between first and second round communications was not a 'one-size-fits-all'. TGS introduced suggested dates for relevant persons to provide feedback by in order to keep the process progressing, however would always reassure relevant persons they could have additional time if required. It is considered that multiple attempts to engage and the provision of subsequent updates regarding the survey details and any changes/revisions is characterised as a "*reasonable period*" to support relevant person feedback. Where no response has been received following the passing of a "*reasonable period*", this has been recorded within the communications correspondence (**Appendix H**) as ongoing or continuing consultation and TGS continues to contact the relevant person by providing updates and opportunities to contact TGS. In more recent correspondence, TGS has asked persons to advise them if they no longer wish to be contacted and removed from the consultation process and several persons have requested this.

As outlined within **Section 5.4.5**, a system has been developed as a starting point for consulting with relevant persons. Where relevant persons identified the need for additional time to adequately assess the potential impacts from the Otway Basin 3D MC MSS on their functions, interests, or activities, this was then worked through with them on a case-by-case basis to ensure a bespoke consultation process was accommodated. Although this was undertaken as part of initial consultation, a follow-up with each relevant person was undertaken to provide further updates to the project and provide the relevant person(s) with a further opportunity to engage with TGS about how their functions, interests or activities may be impacted by the Otway Basin 3D MC MSS. By reaching out on multiple occasions this accounts for potential availability or accessibility issues that the relevant person may have and ensures a lack of response is not attributed to incorrect contact details.

Where there has been no response from a relevant person, TGS has researched alternative contacts through questioning other relevant persons or further internet or database searches.

TGS also notes feedback from the Regulator and relevant persons, including peak industry representative bodies, regarding the possible impact of 'fatigue' on the amount of consultation. Given the number and frequency of similar projects proposed and occurring within the broader SEMR, it is understood from relevant persons consulted as part of preparing this EP that many relevant persons have received a high volume of communications from titleholders, resulting in decreased capacity and willingness to consult. With respect to this constraint, TGS acknowledges the relevant person's comments and advises them they will remain within the consultation program to continue to receive updates and an invitation to contact TGS at any time throughout the project with any comments or queries. Other offers to assist with consultation fatigue was provided by TGS, including targeted, concise, and fit-for-audience information to make communication/understanding easier, and in order to develop relations and build trust and reliability for this Seismic Survey, and future applications. Additional time was provided where requested to account for the consultation fatigue felt by some of the relevant persons.

5.5.2 Level of engagement

Identified relevant person(s) have been prescribed a level of consultation based on their individual requirements. This has been a bespoke basis, and as stated above, not a 'one-size-fits-all' approach is applicable. The effort of consultation across relevant persons was therefore variable, and dependent on individual requirements. These levels of consultation effort can be best described as either 'involved', 'consult' or 'inform' based on the anticipated area of interest and the functions, activities, or interests of individual relevant person(s). These levels of effort are described in general terms as follows:

- An 'involved' or 'pro-active' level of consultation effort for relevant persons(s) is whereby TGS works directly with relevant person(s) throughout the consultation process to ensure that concerns, queries, and requests for information by relevant person(s) are consistently understood and considered. This consultation was targeted based on the relevant specific areas associated with their functions, interests, and activities, and where required the relevant persons were involved in the development of control measures. The intention of this consultation is to seek direct feedback on the proposed Otway Basin 3D MC MSS with a focus on understanding the values and sensitivities of each relevant person and ensuring potential impacts to those values and sensitivities are mitigated through control measures and commitments made in the EP;

- Consultation effort described as a routine ‘consult and seek feedback’ level of consultation, is where TGS seeks to gather feedback from relevant person(s) to understand values and sensitivities should the relevant person(s) consider they are impacted by the Otway Basin 3D MC MSS. The intention of this consultation is to seek direct feedback on the proposed Otway Basin 3D MC MSS with a focus on understanding the values and sensitivities of each relevant person and ensuring potential impacts to those values and sensitivities are mitigated through control measures and commitments made in the EP; or
- Consultation relevant persons requiring a lower effort as an ‘inform and seek feedback’ level of consultation, is where TGS provides relevant person(s) with balanced and objective information to assist them in understanding the activity, impacts and controls. Opportunity to provide feedback or ask for further information that may be relevant to their functions, interests, or activities, is provided through TGS communication channels. The intention of this consultation is to seek direct feedback on the proposed Otway Basin 3D MC MSS from those persons that are not actively known at the time and provides an opportunity for relevant persons who have not been identified to self-identify and provide information on any values and sensitivities they may have. If any feedback is received, TGS will review with the intention of ensuring those values and sensitivities that have been raised are mitigated through control measures and commitments made in the EP. Public notification through newspaper advertisements is the most likely way this will take place and will be ongoing through the EP process as part of the continuing consultation process.

Table 40 sets out the key activities, tools, information provided, and justifications for each Category of relevant persons. It is noted here, that depending on individual requirements, relevant persons information packages and follow up consultation are combinations of tools/activities and have been based on the whether the relevant persons needed/wished to continue the consultation (i.e. additional activities/tools were not used if the relevant person did not identify the Seismic Survey as a concern to them).

Table 40 Consultation Activities and Tools across different levels of effort of consultation for relevant persons

Level of consultation effort	Activity / Tool	Information provided	Timeframes and Justification*
Involved level of consultation	Direct consultation 'Face to face' meetings or via online meeting Organised phone calls Follow up calls/video conferencing Ongoing email exchanges	Targeted and specific Information EP publication notification (national, state regional) Individual email /email follow ups Meeting minutes Phone records	Multiple communication attempts (minimum 2, and more as required), including pre-activity, and post activity notification processes. Timeframes are to be ongoing if required on a case-by-case basis.
Consult and seek feedback level of consultation	Email exchanges as required or requested by Category B relevant persons Phone calls or video meetings as requested by relevant persons	Information sheet EP publication notification (national, state regional) Email exchanges/email summaries	Multiple communication attempts (minimum 2, and more as required), including pre-activity, and post activity notification processes. Timeframes may be extended if requested.
Inform and seek feedback level of consultation	Notification via public media outlets (i.e. newspaper notices with request for feedback to the TGS email address included within notice.	Information sheet EP publication notification (national, state regional)	Minimum two separate occasions, generally variable periods of time across the initial and follow up communication

All efforts that have been undertaken as part of the consultation process are included within Appendix H and Appendix K. These appendices note the attempts that have been made despite no response in some instances.

For relevant persons requiring active 'involved and/or 'seek feedback' levels of effort, targeted consultation since early 2023 with relevant persons was initiated by TGS to identify their level of interest in the project, potential impact from the project and to begin developing control measures (if needed) to address their concerns with respect to the Otway Basin 3D MC MSS. Consultation with these relevant persons remains ongoing through the EP evaluation process and will continue for the duration of the EP. Any feedback provided by a relevant person will be carefully considered and if a change is required, will be done so through the management of change process. Any communications or feedback received is logged as part of the continuing consultation register.

For the 'inform and seek feedback' level of consultation for relevant persons, all notifications will be undertaken in accordance with statutory timeframes for public notification under the regulations (see **Section 5.1**). In addition, these notifications will also be ongoing through the newspaper advertisements that will be placed in relevant newspapers that also informs those potentially relevant persons that were not known at the time of preparing the EP. Should any feedback be provided, it will still be considered and incorporated where relevant through the management of change process.

The consultation programme with relevant persons comprised of the following phases:

- Targeted relevant persons consultation (mid 2022) focusing on commercial fishing groups that included disseminating an information sheet providing an overview of the proposed activities and location details (see **Section 5.5.3**);
- Targeted and bespoke relevant persons consultation (from early 2023) scope expanded to include the following groups;
  - Academic and research organisations;
  - Government agencies and departments;
  - Commercial fishing groups;
  - Environmental groups;
  - Petroleum and gas entities;
  - Offshore infrastructure entities;
  - Ports and shipping entities;
  - Recreation and tourism groups;
  - Recreational fishing groups;
  - Traditional Owner groups; and
  - Other relevant persons self-identified, such as individuals.
- Pre-activity notification;
- Continuing relevant persons consultation; and
- Post-activity notification.

At the outset, general consultation material was disseminated to all relevant persons to initiate communications between the proponent and relevant persons, provide an opportunity to establish a meeting and to introduce the proposed Otway Basin 3D MC MSS. Using the information gained during the relevant persons identification process and based on feedback received regarding the information sheet, key relevant persons were identified for specific consultation. The nature of specific consultation is such that it's tailored to, and therefore highly variable amongst the range of specific relevant persons. Specific consultation may include increased frequency of communications or more detailed communications regarding the potential impacts to the relevant persons activities or a change in the mode of communications (for example, phone versus email) utilising the general activities/tools identified in **Table 40**.

Of note, is that not all general consultation communications occurred concurrently. As the development of the EP progressed, new sensitivities, receptors and corresponding 'relevant persons' were subsequently identified. Where this occurred, additional relevant persons were contacted as soon as reasonably possible to notify them of the proposed Otway Basin 3D MC MSS and, therefore, were communicated on an as needs basis.

As a result of the consultation programme and ongoing follow up with those that have not responded, TGS is confident that it has provided relevant persons with sufficient information to make an informed assessment, as well as providing a reasonable period for each relevant person to consider all the information received and provide any feedback for TGS to assess any claims raised and implement any additional controls as required.

5.5.3 Information Sheet

To support the consultation with relevant persons, an information sheet was developed to introduce relevant persons to marine seismic surveying and provide an overview of the proposed Otway Basin 3D MC MSS, including location of the OA, AA and EMBA, survey vessels and equipment, examples of key control measures and to invite relevant persons to provide feedback and contact TGS with their queries and concerns. The relevant persons identified were contacted via email and provided with the information sheet in mid-2022 (**Appendix H**). This information was subsequently made available to relevant persons as they were identified throughout the development of the EP and as a result of the wider consultation process with relevant persons.

The following information was provided to all relevant persons within the information sheet:

- A high-level description of the proposed location of the Otway Basin 3D MC MSS;
- Description of the proposed seismic activity;
- TGS' commitment to communication during the Otway Basin 3D MC MSS;
- TGS' commitment to environmental performance;
- A request to all relevant persons for feedback on the Seismic Survey with full contact details of TGS' representatives provided;
- Location map of proposed OA and EMBA; and
- Reassurance that sensitive information will not be made public if a relevant person informs TGS their information is confidential and not to be made available to public.

When the information sheet was initially sent out to the relevant persons identified first, the size of the AA and OA were larger than the current proposed Otway Basin 3D MC MSS OA and OA. However, with the subsequent reduction in the AA and as the survey specifications were refined and updated, the information sheets and assessment of sensitivities in the EMBA were concurrently updated.

As the consultation and EP process progressed, the information sheet was further refined to address re-occurring queries raised by relevant persons or other learnings, such as clarification of terms or operations. Additionally, a separate information sheet was developed for traditional owner groups that could be further distributed within their communities. In total, four versions of information sheets have been disseminated during the consultation program and copies of these are provided in **Appendix J**.

5.5.4 General Relevant Persons Consultation (mid-2022 to early 2023)

The consultation process sought to initially focus primarily on the functions, activities, and interests of commercial fishing license holders, as well as peak industry body representatives of the commercial fishing industry. After the relevant persons for this were identified, the consultation process commenced in mid-2022. **Table 41** summarises the key consultation events undertaken with commercial fishing groups. This included a series of information briefings, introductory sessions, and targeted meetings with individual commercial fishing industry groups. The process sought to determine what environmental and social values, sensitivities, access rights, commercial interests, risks, and impacts were of most concern to relevant persons in relation to the Otway Basin 3D MC MSS and to establish a precedent for mutual sharing of information between all parties.

Table 41 Key Commercial Fisheries Consultation Events 2022

Stage	Timing	Information Provided
Initial Notification	May 2022	A notification was distributed to stakeholders providing information on the 3D MSS, and associated EP. An information sheet with map was issued.
Call with SETFIA	23 May 2022	SETFIA attended a call with TGS in which a service of SETFIA assessing the overlap of the EP Area with relevant fisheries was discussed.
Commercial Fisheries Briefings	2, 9, 10 and 29 June 2022	Briefings for commercial fisheries with interests potentially overlapping the EP Area were conducted via Microsoft Teams. Briefings included overview of the proposed Otway Basin 3D MC MSS and EP, commercial fishing effort for relevant Commonwealth and State fisheries based on available data, invited questions and discussions, and outlined ongoing engagement. **Note:** no one attended the briefing on 10 June 2022 and, as such, there are no corresponding meeting notes.
Meeting with TSIC	4 July 2022	Meeting with TSIC conducted via Microsoft Teams. Included briefing on the proposed Otway Basin 3D MC MSS and EP, commercial fishing effort based on available data, invited questions and discussions, and outlined ongoing engagement.
Meeting with SRL	5 July 2022	Meeting with SRL conducted via Microsoft Teams. Included briefing on the proposed Otway Basin 3D MC MSS and EP, commercial fishing effort based on available data, invited questions and discussions, and outlined ongoing engagement.
Meeting with ASBTIA	7 July 2022	TGS met in person with ASBTIA CEO in South Australia on 7 July 2022
Fishers in the Tasmanian giant crab and rock lobster fisheries	31 August 2022 7 September 2022	Meetings with representatives from the Tasmanian giant crab and rock lobster fisheries conducted via Teams. Included a briefing on the proposed Otway Basin 3D MC MSS and detailed the giant crab exclusion zone to be implemented during the survey. Invited discussion and input regarding EP.

This initial round of consultation with relevant persons consisted of introductory information presented via emails with an appended information sheet, as well as information briefings and targeted meetings. All relevant persons were encouraged to engage, ask questions, and invited to provide comment or request additional information if they required it. All meeting attendees and email recipients were advised that any information determined to be sensitive will not be made public and were asked to inform TGS if any information is not to be made available to the public.

A record of all feedback received from relevant persons and the responses provided by TGS is summarised in **Appendix K**. Meeting minutes including records of attendance are provided in **Appendix I.**

Where feedback received from relevant persons during this initial phase was assessed as relevant for specific information requirements to be included in the EP, or for specific control measures, these have been assessed and incorporated as required. For example, these include the disseminating of GPS coordinates, implementing a 48-hour operational look ahead plan of look-ahead and notification requirements for planned activities. Feedback from this general consultation with relevant persons was rolled across to targeted and bespoke consultation from the start of 2023, and is ongoing for the duration of the EP.

5.5.5 Relevant Persons Consultation from early 2023 onwards

Consultation continued from early 2023 with a series of targeted information searches to increase the consultation scope to include other groups of relevant persons. A reduction in survey area, prompted a review of modelling that determined the EMBA discussed in **Section 5.4.3** and a revised EMBA was produced in early 2023. The revised EMBA resulted in a review of the consultation approach and who was considered as a relevant person.

This process used the sources of information described in **Section 5.4** and resulted in several key groups being identified, including an expanded group of commercial fisheries, Traditional Owner groups and environmental groups. The full list of relevant persons which were updated by the revised EMBA are included within **Appendix G**. Consultation efforts were increased during February to disseminate information to as many identified relevant persons as possible within the revised and expanded scope, with the intent that this would also facilitate further identification of other relevant persons.

Targeted email campaigns were carried out between 13 – 16 February, to 107 relevant persons across the full range identified to date. This included the relevant persons previously identified during the 2022 general consultation period, as well as existing/known relevant persons identified from a previous EP process for the same regions (Otway 2D MSS).

Consultation during the middle of February 2023 also focussed heavily on efforts to engage with Traditional Owner groups, local councils, and environmental groups, via email, online meetings, and several in-person meetings. Following the February consultation effort, subsequent follow up consultation with relevant persons was implemented on an iterative and case-by-case basis, as described in **Section 5.4.**

For relevant persons who had not responded to initial emails issued during February (and for any relevant persons identified after this period), individual follow up emails were sent to each relevant persons to ask if the relevant person had any comments or queries or required additional information. A customised email response was also sent to those relevant persons who expressed interest in the proposed Otway Basin 3D MC MSS during the first round of consultation, including further high-level information relating to their potentially impacted activities where required.

Following the initial efforts for the targeted consultation, further relevant persons were identified via the relevant persons identified to date. All details of consultation undertaken to date are provided in **Appendix K,** with the assessment of merit of any claims or objections provided in **Appendix K.**

The online and in-person meetings were delivered with the following format:

- Introduction – welcome, introduction of attendees and purpose of meeting;
- Background information about marine seismic surveying;
- Project overview – location, equipment, timing, duration;
- Environmental planning process:
    - Assessment of existing values and sensitivities;
    - Identification of risks and impacts;
    - Determination of control measures;
- Consultation process with the relevant person; and
- Questions and discussion.

At the start of every meeting, the relevant person was advised that TGS was documenting the information from the meeting and to inform TGS if there was any sensitive information that should not be made available to public. Following the meeting, TGS would email the meeting minutes and a copy of the presentation delivered at the meeting and any additional information requested at the meeting and invitation to review the meeting information and advise of any amendments or sensitive information to be removed from public consultation.

5.5.6 Specific Relevant Persons Consultation – Commercial Fishing Industry

The commercial fishing industry is the primary relevant persons with a commercial interest in the maintenance of access to and the condition of the marine environment (e.g. conservation of aquatic resources) within and surrounding the OA. There are multiple licence holders that undertake fishing activity within the OA and who have the potential to be directly impacted by the proposed Otway Basin 3D MC MSS. In contrast, licence holders that undertake fishing activity within the EMBA have the potential to be impacted in the unlikely event of a fuel oil spill.

Consultation with the commercial fishing industry is nuanced due to the multiple tiers in which the functions, interests and activities of commercial fishers are regulated, managed, and represented (Commonwealth of Australia, 2022). As a result, consultation was commonly undertaken with the commercial fishing industry through the consulting some or all of the following relevant persons, as appropriate and in accordance with the method outlined in **Section 5.4**:

- Commonwealth and State industry departments who coordinate the authorisation of commercial fisheries licences, fisheries management and surveillance/enforcement programs within the Australian Fishing Zone and State coastal waters, respectively;
- Peak industry associations and representative bodies who represent the interests and/or activities of commercial fisheries license holders and have authority to consult on behalf of all their members; and
- Commercial fishing license holders (‘commercial fishers’) who may have entitlements to fish within the EMBA.

A preliminary review of fisheries boundaries showed overlap between the extent of both Commonwealth and State fisheries, the OA and EMBA, as described in **Section 4.7.3** and a summary of catch effort data is set out in **Section 4.7.3.1**. To inform the specific relevant persons consultation activity, a detailed assessment of fishing activity within the OA and EMBA was completed using data extracted from ABARES, VFA, DNRET and PIRSA and has been reviewed to further understand the fisheries that are active in waters overlapping and adjacent to the OA.

In addition to reviewing fishing effort data, TGS commissioned SETFIA to compile an additional review of the level of catch made by the relevant Commonwealth and State-managed fisheries within the OA, the proportion of each fisheries’ total allowable catch and the annual average catch value that it represents (based upon data from the ten years prior to 2021).

TGS has also engaged TSIC as subject matter experts to support consultation with Tasmanian seafood operators, liaising with the relevant commercial seafood operators to ascertain and provide feedback to TGS on the potential impacts and concerns about the survey from the industry. Additionally, TSIC will also provide follow-up information and updates to commercial seafood operators from TGS, as requested.

Determining the function of peak industry associations and representative bodies as it relates to consultation on behalf of all their members was important, though challenging. Peak industry associations and representative bodies are variably resourced and experienced in their capacity to respond to titleholders regarding offshore project proposals. However, they maintain independent and effective relationships with those they represent and are also aware of and respect the industry's sensitivity to the overwhelming level of requests for feedback they are currently experiencing from the many proponents required to engage with them. Hence, TGS has experienced varying levels of maturity in processes regarding consultation among these relevant persons.

As a default, peak industry associations and representative bodies were determined to be relevant persons in their own right. An effort was made to ascertain the nature of their delegations to consult with TGS on behalf of all their members, prior to contacting commercial fishing license holders. In some cases, peak industry associations and representative bodies had developed processes for consultation with license holders.

Where practicable, TGS sought to engage with peak industry associations or representative bodies in a transparent manner to ensure the best outcome for commercial fisheries was achieved. As with other relevant persons, this meant balancing the requirements between AFMA and SETFIA, whilst ensuring consultation remained ongoing with commercial fishers represented by these industry groups. For other industry groups, targeted and continuing consultation with TSIC, VFA, SIV and Southern Rock Lobster Ltd was also continued to ensure full representation of relevant persons in the continuing consultation programme, and recognising that many of these groups were at limited capacity to fully engage.

In the absence of a peak industry association or representative body, TGS has conservatively assumed that license holders must be consulted with directly. Additionally, that this consultation was broad enough to capture those with the entitlement to fish.

Likewise, where a peak industry association or representative body or the licensing authority determined it to be required, license holders were consulted in accordance with methods outlined in **Section 5.5.5**. For example, at the start of the EP process, TGS consulted with SETFIA, the peak industry body representing the trawl fisheries license holders. It was acknowledged that whilst SETFIA was a significant peak industry body, SETFIA itself did not want to undertake consultation with its members on behalf of TGS. Whilst AFMA were able to provide details of individual license holders represented by SETFIA, SETFIA were subsequently not in support of AFMA providing individual member details to TGS for this purpose.

Hence, a number of efforts were made to communicate directly with commercial fishers, but this proved difficult.

Responses from representatives of Commonwealth Fisheries, State fisheries, industry associations and peak bodies and commercial fishing licence holders were used to support the findings of the preliminary and detailed assessment of fisheries activities and, ultimately, determine relevant persons which may potentially be impacted by the Otway Basin 3D MC MSS.

Full records of TGS's consultation process to date with commercial fishers is provided in the consultation records listed in **Appendix H**, with the assessment of merit provided in **Appendix K**.

TGS consider that the information provided to licence holders was sufficient to make an assessment of the proposed Otway Basin 3D MC MSS on their activities and should they have concerns, opportunities were provided for the licence holders to undertake further consultation so that TGS could provide any further information they needed or discuss any concerns.

TGS has and will continue to provide commercial fishing industry representatives with shapefiles and a Microsoft Excel spreadsheet containing the GPS coordinates of the OA that would allow fishers to copy and paste directly into their chart plotting computer systems so that they have a better idea on where the operations will occur in relation to their fishing areas.

5.5.7 Specific Relevant Persons Consultation – Traditional Owner Groups

First Nations or Traditional Owner people's values are described in **Section 4.6.1**. As described, Traditional Owner groups occupying coastal and near shore (including island) areas of NSW, South Australia, TAS, and VIC identify Sea Country as a central value for First Nations people. Although Sea Country cannot be physically defined, discussions with First Nations people suggest it encompasses both tangible and intangible values present in coastal areas across estuaries, beaches, bays, and offshore marine habitats, thus Sea Country values and sensitivities may include:

- Marine and avian species that hold significant and deep connections to lore and spiritual values;
- Cultural harvesting (historic and contemporary) of marine flora and fauna; and
- Sea and landscape features that hold significance spiritual values (such as dreamtime and creation values).

Traditional Owner groups that were identified as relevant persons were identified in general accordance with the process outlined in **Section 5.4**. Database searches via the National Native Title Tribunal Register[9] were conducted, as well as searches using the state based Aboriginal Heritage sites (where possible), as well as information sourced from the Australian Institute of Aboriginal and Torres Strait Islander Studies[10] and the Office of the Registrar of Indigenous Corporations[11]. Further searches were then conducted on individual Prescribed Bodies Corporates, Registered Aboriginal Parties, Native Title Holders, and individual Traditional Owner groups using keyword searches on the internet and social media pages that relate to traditional owner names, location and interest or function, etc. These search efforts focussed on coastal groups within VIC, NSW, South Australia and TAS that overlapped or were within close proximity to the EMBA, acknowledging that Sea Country could extend to the EMBA from locations outside and adjacent to the EMBA.

TGS identified 34 relevant persons as a Traditional Owner group and these relevant persons encompass a wide variety of organisations including land councils, Prescribed Bodies Corporates, Registered Aboriginal Parties, Native Title Holders, organisations that offer Traditional Owner groups legal support and groups that represent individual Traditional Owner people.

TGS initially contacted Traditional Owner groups via email or phone providing introductory information about the survey, via email including the information sheet. TGS would then offer either an in-person or online meeting to ascertain the most appropriate method for consulting their people going forward and the response varied depending on each relevant person's level of interest or function. Again, as with other relevant person groups, further information was provided on a case-by-case basis and was tailored to their individual requirements.

[9] http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-National-Native-Title-Register.aspx
[10] Australian Institute of Aboriginal and Torres Strait Islander Studies (aiatsis.gov.au)
[11] Office of Registrar of Indigenous Corporations | Office of the Registrar of Indigenous Corporations (oric.gov.au)

A lot of the relevant persons particularly within NSW, South Australia and parts of TAS could not understand why TGS was contacting them, given the proximity of the OA to their location. However, TGS explained the EMBA and regulatory requirement to consult with all relevant persons.

Following initial communications with identified Traditional Owners groups were also asked if they wished to or were able to identify TGS of other potentially relevant persons who may also which to be consulted. In the event of new Traditional Owners being identified, they were contacted by TGS to ensure that they were made aware of the EP development, provided with the relevant information, and included into the continuing consultation process on a case-by-case basis.

Following consultation with Traditional Owner representatives and feedback provided, a more specific information sheet for Traditional Owner groups was developed, which was focused on the details of the Otway Basin 3D MC MSS and the control measures in place addressing their queries and concerns noted in previous meetings.

TGS will continue consultation with all Traditional Owner groups within their consultation register (or newly added groups) throughout the duration of the EP development process, and for the duration of the implementation of the Otway Basin 3D MC MSS itself, unless requested otherwise by the Traditional Owner group, for example to be removed from the consultation program.

The full records of all Traditional Owner groups consulted with to date are included in the consultation log provided in **Appendix H**. Where applicable, the assessment of merit of any objections or claims identified in the consultation process are also provided, along with the full record of all consultation processes (emails, telephone calls, meetings) included in **Appendix K**.

5.5.8 Specific Relevant Persons Consultation – Environmental Groups

Given the location and proximity of the Otway Basin 3D MC MSS to the significant environmental values and sensitivities identified in **Section 4**, TGS determined it was essential to engage with environmental groups that may have a function, interest or activity impacted by the Otway Basin 3D MC MSS. Similar to Traditional owner groups, environmental groups that were identified as relevant persons were identified in general accordance with the process outlined in **Section 5.4**. This included keyword searches on the internet and social media for any environmental groups that are present within the general vicinity of the EMBA with particular focus on coastal and marine areas in VIC and TAS, or those groups that have a national function or concern across Australia (e.g. Australian Conservation Foundation), or globally (International Fund for Animal Welfare). At the time of submission, TGS is corresponding with 19 environmental groups.

Following initial communications with identified environmental groups were also asked if they wished to or were able to identify TGS of other potentially relevant persons who may also which to be consulted. In the event of new environmental groups being identified, they were contacted by TGS to ensure that they were made aware of the EP development, provided with the relevant information, and included into the continuing consultation process on a case-by-case basis.

TGS will continue consultation with all environmental groups within their consultation register (or newly added groups) throughout the duration of the EP development process, and for the duration of the implementation of the Otway Basin 3D MC MSS itself, unless requested otherwise by the environmental group, for example to be removed from the consultation program.

The full records of all environmental groups consulted with to date are included in the consultation log provided in **Appendix H**. Where applicable, the assessment of merit of any objections or claims identified in the consultation process are also provided, along with the full record of all consultation processes (emails, telephone calls, meetings) included in **Appendix K**.

5.5.9 Management of Objections and Claims

Any objections or claims raised during consultation, including during continuing consultation, are substantiated utilising publicly available information, including scientific literature and/or fishing data where available. Where an objection or claim is substantiated, it will be assessed as per the risk assessment process outlined within **Section 6** and, depending on the outcome of this assessment, appropriate controls will be applied to manage the impacts and risks to **ALARP** and an **Acceptable Level**. Further to this, if the objection or claim triggers a revision of the EP, this will be managed in accordance with the Management of Change process outlined within **Section 10.4.6**. TGS will advise the relevant person that raised the objection or claim of the outcome of this process, including whether or not the objection or claim is substantiated, how it was assessed and what, if any, controls were put in place to manage the impact or risk to **ALARP** and an **Acceptable Level**.

A number of responses have been received from relevant persons since the consultation programme has commenced. The nature of responses was varied; some included requests for further information about the survey equipment or operations, or to be kept informed and some noted that the proposed survey was not relevant for their interest in the area. Where objections or claims were received, these were addressed as per the discussion above, with details on how these were addressed within the EP being outlined within **Appendix I**. These claims were considered to be adequately addressed through the development of this EP and associated control measures and operational procedures.

Some objections and claims were outside of the scope of the EP and the proposed activity, particularly relating to the general opposition to the extraction and drilling of fossil fuels. When such a submission is received, TGS advises the relevant person they acknowledge and note their comments and will continue consultation to keep them updated with the survey progress.

Likewise, in accordance with the Environment Regulations 16(b)(ii) all objections and claims that TGS has received until **16 June 2023** have been considered in the assessment of risk and responses and within the development of this EP and control measures, which have been tailored where necessary to reduce the risks to **ALARP** and an **Acceptable Level**. The 16 June 2023 was selected as an arbitrary date to assist with preparing this EP for submission. TGS acknowledges that consultation with all relevant persons within the TGS consultation program is continuing consultation for the completion of this EP and likely to continue for many of the relevant persons throughout the duration of the EP.

The control measures in **Section 7** and **Section 8** that will be implemented throughout the Otway Basin 3D MC MSS are considered adequate to reduce impacts of the Otway Basin 3D MC MSS, and in particular the protection of the BIAs and their corresponding receptors to **ALARP** and an **Acceptable Level**. Where existing control measures did not adequately address any objections or claims made, additional control measures were identified and implemented.

In accordance with the Environment Regulations 16(b)(iii), the claims that have been made by relevant persons are summarised in **Appendix M**, with the response by TGS and the relevant section within the EP where those concerns are addressed. The full correspondence between the relevant persons and TGS is provided in **Appendix H**.

5.5.9.1 Self-Identification of Relevant Persons

[TBC following 30-day public notification period]

5.5.10 Assessment of Provision of Sufficient Information and Time to Respond

Regulation 11A(2) of the Environment Regulations states that:

> *"For the purpose of the consultation, the titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person."*

As detailed within **Section 5.5.3** the initial consultation included the provision of an information sheet to all relevant persons; consisting of an information sheet and a detailed email. This information sheet outlines various aspects of the Otway Basin 3D MC MSS including the location of the OA, a description of the proposed seismic activity, approximate timing and duration, vessels and equipment and the adherence of TGS to the relevant legislation. In addition, where further information was requested by a relevant person, this has been provided on a case-by-case basis.

Given the bespoke nature of the consultation methodology, and that TGS has provided the full scope of the Otway Basin 3D MC MSS and any additional information upon request on a case-by-case basis, it is considered that the information provided has been sufficient for the relevant persons to make an informed decision on whether their activities would potentially be impacted by the Otway Basin 3D MC MSS. This process also made available the opportunity for relevant persons to provide feedback, raise concerns, participate in further consultation, and submit any objections to TGS.

An assessment of sufficient time and reasonable periods is described in **Section 5.5.1.** It is re-iterated, given the iterative consultation process, and that where further information and consultation has been requested, this is subsequently accommodated for in extending the period required for consultation. In all cases, where further information was requested, it has been provided where possible. Some very specific requests have been particularly challenging due to timing and development of the EP. New information provided by relevant persons or discovered during research meant the EP is frequently being updated and therefore information distributed to relevant persons outdated. When communicating with relevant persons in this situation, TGS expressed their preference to provide certain information once the EP had been finalised and released for review.

To ensure TGS had provided sufficient information, they would ask all relevant persons during the on-line and in-person meetings, whether there were any further queries before closing the meeting and would always extend an offer at the meeting to contact TGS if the relevant person required additional information. TGS would also offer to provide additional information to their relevant persons within most email correspondence.

All relevant persons currently within the consultation register are considered 'active' and consultation with them will continue for the duration of and following the Otway Basin 3D MC MSS until required. Engaging with these organisations provided TGS with a greater understanding of the potential impacts the Otway Basin 3D MC MSS may have on the licence holders and their activities. TGS has also increased its effort for relevant persons that did not respond, to identify alternative contact details or contact methods in case the contact details were no longer valid. All relevant persons that TGS has not received a response from will remain in the consultation program as with those persons who have responded and receive updates throughout the duration of the EP.

Based on the discussion and information provided above, TGS considers that the information provided to the relevant persons during the consultation process has been sufficient and that relevant persons have had sufficient time to consider the information and make an informed decision as to any potential impacts of the survey on their activities, in accordance with the Environment Regulations and relevant guidance.

5.5.11 Fulfilment of Consultation Obligations

As outlined within the Guidance Document, the obligation to consult must be discharged prior to submitting an EP to NOPSEMA. In order for the consultation to be considered fulfilled, the following matters need to be addressed:

- The provision of sufficient information as per **Section 5.5.1.3**;
- A reasonable period of time to make an informed decision must have been demonstrated as per **Section 5.5.1.4**; and
- If any objections and claims are raised during consultation, it is a requirement that these are adequately assessed and addressed, where valid, as per the discussion within **Section 5.5.9.**

An assessment of whether consultation with each relevant person has been fulfilled is included within the Relevant Person Consultation Report within **Appendix I**.

One of the main aspects of this assessment is in relation to the response(s) that were received from the relevant persons. As an example of this assessment, where a relevant person has not responded to consultation (with the provision of sufficient information), and a reasonable period of time has elapsed, then this consultation would be considered fulfilled but continues in order to receive updates on the project.

It is worth noting that although the fulfilment of consultation with relevant persons is a key aspect of the EP process, TGS will continue to undertake consultation with relevant persons in an ongoing manner as outlined within **Section 5.5.9**.

5.5.12 Continuing General Relevant Person Consultation

TGS will continue to engage with all relevant persons for the duration of the Otway Basin 3D MC MSS, in accordance with the Environment Regulations 14(9), to provide project updates and keep them informed as information becomes available. To achieve this, TGS set the following objective with regard to continuing consultation, as part of the relevant person consultation programme (see **Section 5.2**), that being 'support ongoing relevant person identification and consultation throughout the project'.

The objective was underpinned by the following outcomes, each of which were considered necessary for successful continuing consultation:

- Continual identification of relevant persons that may be affected by the Otway Basin 3D MC MSS;
- Provision of sufficient information to all relevant persons identified; and
- Continual identification and resolving of any issues that may arise as identified by relevant persons.

Continuing consultation, as described in the relevant objectives and outcomes above, will be achieved by implementing the following actions:

- At least six weeks prior to survey commencement, TGS will perform a desktop review to assess for any new relevant persons in the region. This assessment will include all relevant EP submissions and a review of relevant persons identified by other proponents of seismic operations in any newly accepted EPs;
- In the event that a new relevant person is identified by TGS, they will be contacted as soon as possible to provide them with sufficient information regarding the Otway Basin 3D MC MSS. This will include a description of the identified impacts and associated control measures that are being implemented so that it is clear to see that the risks to this particular relevant person will be reduced to **ALARP** and **Acceptable Levels**; and
- TGS will distribute information sheets at selected locations that target recreational users who are transient to the OA. For example, at retailers that sell recreational fishing gear and local dive shops.

Where the above actions have not resulted in successful notification to relevant persons and there are relevant persons out within the OA, TGS will lean on one Support Vessel and one Chase Vessel on the water during the Otway Basin 3D MC MSS. These vessels will be in contact with other maritime users during the survey and will be able to identify any vessels on the water that are unaware of the survey operations and ensure that no vessels travel in close proximity to the Seismic Vessel or streamers towed behind the vessel.

In addition to this more generalised continuing consultation process with relevant persons, some relevant persons will be consulted with in an ongoing manner where some of the matters raised during the initial consultation are complex in nature and often in relation to activities outside the scope of this EP, or these discussions involve establishing an ongoing relationship with the relevant person(s).

Should any relevant person raise any objections or claims or provide feedback during this continuing consultation that has not previously been considered within the development of the EP, these will be managed as per **Section 5.5.9**.

The following decision support resources would be applied to assess whether any potential change in impacts or risks was significant:

- Classifications of existing impacts and risks within the risk assessment matrix in this EP;
- Legislative requirements, guidelines, standards;
- Relevant literature;
- UAM results;
- Sound thresholds within the EPBC Act;
- The Temporary Threshold Shift (**TTS**) and Permanent Threshold Shift (**PTS**) for the relevant receptors identified within the OA (**Section 7.2**); and
- Professional Judgement.

5.5.13 Pre-activity Notification to Relevant Persons

Prior to commencing the Otway Basin 3D MC MSS, TGS will provide specific details to all relevant persons in relation to confirmed project timing and location. A number of temporal and spatial driven mitigations have been implemented into the survey planning to reduce the impacts on blue whales within the BIA to **ALARP** and an **Acceptable Level**.

TGS has also committed to providing relevant persons with 48-hour look-ahead of where the survey vessels will be, so that they can then incorporate the survey plans into their operations. This look-ahead will be updated every 24 hours.

Navigational warnings and Notice to Mariners will also be issued on maritime radio and via email correspondence which provide information about the Seismic Vessel, including the Seismic Vessel being restricted in its ability to manoeuvre due to towing the streamer array.

A summary of the pre-activity notification process by TGS is provided in **Table 42**.

Table 42 Pre-Activity Notifications by TGS

Timing – prior to the Seismic Survey	Stakeholder	Information to be Provided
Approval of EP	DNP	That the EP has been approved by NOPSEMA via email to MarineParks@environment.gov.au
4 weeks	All relevant persons identified	• Summary of proposed activity • Summary of vessel and seismic gear • OA coordinates • Date of activity commencement • Duration of activity • TGS contact details
4 weeks	Australian Defence Force	• Operational area coordinates • Date of activity commencement
4 weeks	AHO	Contact AHO at datacentre@hydro.gov.au with details relevant to the operations to promulgate the appropriate Notice to Mariners. Updates will be provided to AHO on progress and, importantly, any changes to the operations.
10 days prior	NOPSEMA	Written notification of the date of intention to commence the Seismic Survey that is included within this EP.

Timing – prior to the Seismic Survey	**Stakeholder**	**Information to be Provided**
At least 24-48 hours prior to operations	AMSA's Joint Rescue Coordination Centre (**JRCC**)	Contact JRCC by email (rccaus@amsa.gov.au) for promulgation of radio-navigation warnings. The JRCC requires: • Vessel details (including name, callsign and Maritime Mobile Service Identity) • Satellite communication details (including INMARSAT-C and satellite telephone numbers) • Area of operation • Requested clearance from other vessels • Date of activity commencement • Duration of activity • TGS contact details • Any other information that may contribute to safety at sea Updates should be provided to JRCC on progress and, importantly, any changes to the operations.

5.5.14 Post-activity Notification to Relevant Persons

There are also some post-survey notification requirements that TGS are required to adhere to. These are provided in **Table 43**.

Table 43 Post-Activity Notification Requirements

Timing – post **Seismic Survey**	Stakeholder	Information to be Provided
Relevant time post-completion	All relevant persons	Notification that the survey is now complete, and the survey vessels are no longer in the area.
Relevant time post completion	AMSA	Summary of any significant or noteworthy interaction with commercial shipping during the Otway Basin 3D MC MSS.
10 days post completion	DMIRS	Provide a cessation notification to petroleum.environment@dmirs.wa.gov.au. Consultation with DMIRS resulted in this request, and although no timeframe was provided, a 10-day notification period has been utilised to align with NOPSEMA notification.
10 days post completion	NOPSEMA	Written notification to NOPSEMA advising of the completion of the survey.
As soon as practicable	NOPSEMA	Written notification to NOPSEMA advising that all of the activities and obligations covered under the EP have been completed.

5.6 Public Comment

NOPSEMA will publish TGS' EP on their website in accordance with the Environment regulations 9(AB) and 11B for a period of 30 days. It will be notified that the EP will be available for public comment on NOPSEMAs website by the following means: TGS's website, a national newspaper (The Australian – National Daily), state-wide newspapers (TBC) and regional newspapers close to the OA (TBC).

Any submissions received during this 30-day public notification period will be treated in accordance with the relevant persons consultation programme as outlined in **Section 5.5**. In accordance with the framework, all merits of the submissions will be assessed according to the functions, activities and interests of the relevant persons, the merits assessed, and if required, be subject to the continuous consultation programme following the 30-day consultation period. Where applicable and as required following the continuing consultation process, any relevant persons identified during the 30-day period will have the same opportunity to be fully informed through the entire Otway Basin 3D MC MSS programme (i.e. 48 hour look-aheads), as well as providing all the pre-survey notifications prior to survey commencement.

5.7 Fuel Oil Spill Response Emergency Consultation Protocols

This section sets out the process TGS will follow in the event of an unplanned release of fuel oil to the marine receiving environment. There are two key components to the process: the role of the OPEP, and the communication with relevant persons. This section identifies the relationship between the two processes.

5.7.1 Oil Spill Emergency Plan

Section 10.10 sets out the OPEP – TGS's arrangements for responding to a fuel oil spill (Level 1 or Level 2) event during the Otway Basin 3D MC MSS. The OPEP follows the framework and requirements set out in the National Plan for oil spill event response.

Table 147 lists the division of responsibilities between statutory authorities and the nominated Control Agency (**CA**) for a Level 1 or 2 spill. The role of the CA is to assume control, including decision making ability, to respond to any oil spill incident and respond in accordance with the National Plan.

Under the OPEP, notification processes are the responsibility of the Vessel Master. **Table 148** sets out the OPEP notification process and timeframes for both Level 1 and Level 2 responses. This includes responsible authority direct numbers, and key instruction for notification.

On this basis, the focus of the OPEP is on the CA's decision-making process, as guided by the National Plan to implement notification processes, instigate the Net Environmental Benefit Analysis (**NEBA**), and to instigate decisions as to the appropriate course of action (including response logistics, liaison with TGS's Project Manager to instigate the Operational and Scientific Monitoring Plan (**OSMP**)) under a Level 1 or Level 2 spill event.

5.7.2 Relationship of OPEP to Relevant Persons

Relevant person(s) are not formally included in the notification process described in **Section 10.10.6.3**. The roles of the agencies/personnel, under the direction of the CA, are focussed on the containment of the spill, and immediate (within hours to 48 h) need to provide information and updates of any event to Statutory Agencies (**Table 148**). The full list of relevant persons is provided within **Appendix G**.

Although relevant person(s) formally sit outside the OPEP Notifications process, in the event of a fuel oil spill, relevant persons will need to be notified to ensure they have timely and sufficient information to carry out their functions, inform their own stakeholder groups, manage their own decision making processes, and manage their (and their stakeholders) own risks accordingly. Procedures are in place with industry body relevant persons on an as needs basis, that should a fuel oil spill release occur, TGS will notify affected industry bodies immediately and those bodies will inform all licence holders that could potentially be impacted by a fuel oil spill. TGS would still undertake its own notifications, but the agreement with industry bodies will specifically target the licence holders that use the area identified in the wider EMBA.

The notification and emergency consultation with relevant persons, in the event of an oil spill, recognises:

- Emergency notification is undertaken in good faith and with transparent, accurate and timely information;
- Relevant persons may hold different values and interests in the affected area of the unplanned event; TGS are not making decisions or judgments about the values of the relevant persons and what may be of importance for managing actual or perceived risk management of the relevant person(s); and
- Relevant persons are best placed to inform TGS and the CA about the impact of the spill on their particular interest; information of specific interests, values and sensitivities of relevant persons can be incorporated into the NEBA where possible, which may be used to inform the logistical response process and requirements of any OSMP. The list of relevant persons that have been consulted with are included in **Appendix G**.

It is important to note for the Emergency response process, CA may also be relevant persons (depending on the jurisdiction, and where the governmental agency has an interest/value in the affected area), but relevant persons are not automatically a CA.

5.7.3 Consultation with Relevant Persons

The following section describes the general consultation process with relevant persons that will be followed in the event of a Level 1 or Level 2 spill, shown schematically in **Figure 71**. It is intended that this process is strongly aligned with the OPEP (**Section 10.10**) as well as the OSMP (**Appendix L**) and is aimed at meeting the information requirements for any relevant persons requesting notifications for a Level 1 or Level 2 spill.

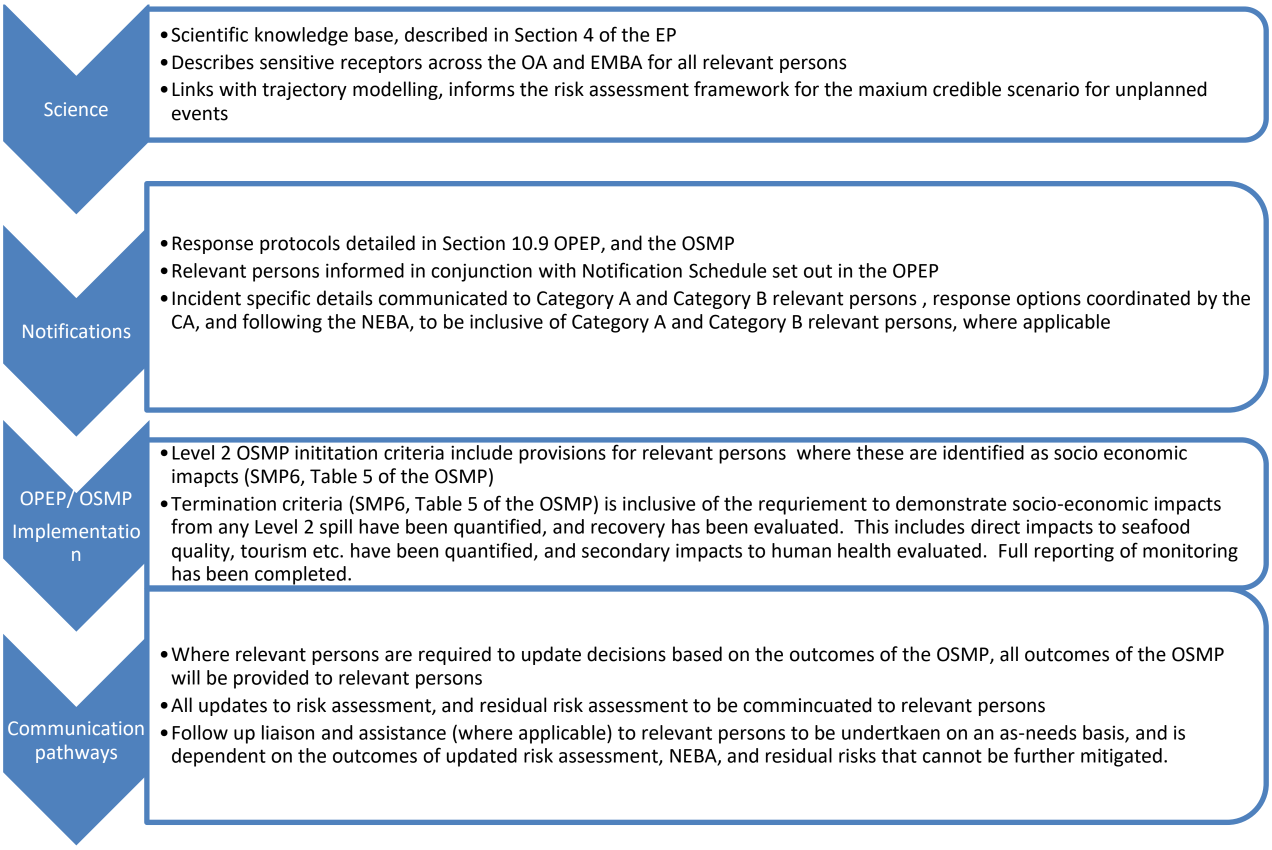


Figure 71 Information Pathways for Informing Relevant Persons under Level 1 or Level 2 Spill Scenarios

5.7.3.1 Scientific Knowledge Base

Fundamental to understanding actual or perceived risks to sensitive receptors is a solid understanding of the aquatic biota and marine receiving environment in the vicinity of the Otway Basin 3D MC MSS. The current state of scientific knowledge as it relates to aquatic biota and marine receptors within the OA and EMBA are detailed in **Section 4**. This knowledge directly serves to inform the NEBA (**Section 10.10.5**) under any real time trajectory modelling, in the unlikely event of a Level 2 Spill assessment.

Combined with the assessment of risks (**Section 8.4**), updates to actual or perceived risks to sensitive receptors can be benchmarked against the current state of knowledge.

5.7.3.2 Notifications

Section 10.10.6.3 sets out the notifications process to be adhered to in the event of a Level 1 or 2 Spill. Accordingly, Category A and Category B relevant persons, as identified by the location and nature of the spill, will be notified in conjunction with the statutory agencies as per the schedule in **Table 148**.

TGS are not in the position to impose decision making processes onto any relevant persons but will ensure that relevant persons are provided with the most up to date and relevant scientific knowledge so that relevant persons are in the position to develop fully informed decisions to manage their interest in the affected area. For example, decisions to close fisheries, or restrict contact recreation, fall outside the expertise and commercial knowledge of TGS, but TGS will ensure all up to date science-based information is communicated to affected relevant persons so that they are in a position to coordinate managed responses, including the management of actual or perceived risks to their own stakeholder groups.

5.7.3.3 OPEP/OSMP Initiation and Implementation

Initiation of logistic response actions from a Level 1 or Level 2 spill are the responsibility of the CA. For a Level 2 spill, the response process follows the implementation process set out in **Figure 3** of the OSMP. This process indicates the NEBA is undertaken early in the response, as well as following the monitoring and reporting requirements to ensure any spill is remedied and effects are mitigated.

The OSMP describes Type 1 and Type 2 (Scientific) criteria for both the initiation and termination of monitoring. Provision of socio-economic impact monitoring (inclusive of affected relevant persons) is included as key criteria for any scientific monitoring programme. The process of OSMP initiation and termination also serves to inform the NEBA to ensure the appropriate course of response is being implemented, and to ensure all affected relevant persons are provided with sufficient and timely scientific knowledge to manage stakeholder risks (actual and perceived).

5.7.3.4 Communication pathways

All outcomes of the OPEP and OSMP will be communicated to affected relevant persons where decisions are required to inform any updated actions the relevant person have been required to undertake due to any Level 1 or 2 spill event during the Otway Basin 3D MC MSS. Given the OSMP is specific to initiation criteria (see **Table 5** of the OSMP, **Appendix O**), and decisions pending the CA and updated NEBA, specific timeframes for communication processes to relevant persons cannot be defined at this stage. In the event of a Level 2 spill, and any OSMP implementation, communication/consultation with relevant persons (concerned with socio-economic impacts) is also included as part of the initiation criteria (see SMP6, **Table 5** of the OSMP, **Appendix O**).

Information provided may include:

- Outcomes of secondary NEBA, with focus on any sensitive receptors specific to affected relevant persons if required;
- Updated risk assessments undertaken for sensitive receptors, informed by real time trajectory modelling and updated information about the spill characteristics; and
- Updated knowledge about any potential residual risks to sensitive receptors, following the implementation of mitigations and actions as directed by the CA during the implementation of the OPEP and OSMP response.

In the event that residual risks to sensitive receptors are unacceptable to affected relevant persons, TGS will seek to engage to fully understand and assist where applicable the extent to which further actions under the OSMP and NEBA can be beneficial.

For Commercial Fishers, TGS has agreed to financially support the commercial fishing industry (as represented by peak industry bodies SETFIA, VFA and TSIC) in the unlikely event of an unplanned spill impacting the industry as per the TGS Loss Adjustment Protocol. TGS will consider any claims for compensation from licence holders on a case-by-case basis, and may be provided in the following circumstances:

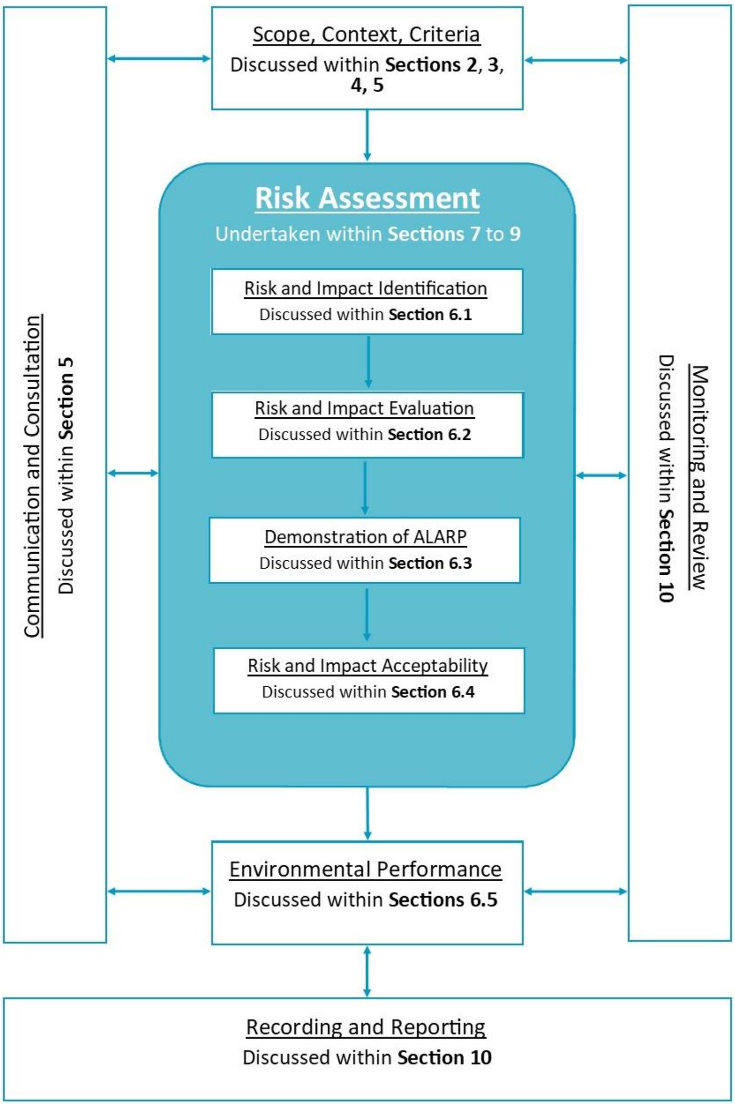
- Fishing equipment has been damaged as a direct result of a fuel oil spill from the Otway Basin 3D MC MSS; and
- A licence holder experiences a reduction in historical average Catch Per Unit of Effort as a result from either perceived or actual impacts associated with a fuel oil spill from the Otway Basin 3D MC MSS.

In order to receive compensation, a licence holder must be able to show that they would have received the revenue from the landed catch that is subject to the claim, incurred additional costs associated with perceived or actual impacts, or have incurred costs from lost or damaged fishing equipment.

6 Environmental Impact and Risk Assessment Methodology

Regulation 13(5) and 13(6) of the Environment Regulations requires TGS to include details of all environmental impacts and risks arising from or associated with the proposed activity, along with an evaluation of these impacts and risks. The assessment should give appropriate consideration to the nature and scale of each impact or risk, and whether these are likely to be realised as a result of planned and unplanned operations. Accordingly, this assessment must detail the control measures which will be utilised to reduce the impacts and risks of the activity to **ALARP** and an **Acceptable Level**.

The following impact and risk assessment methodology has utilised the joint Australian & New Zealand International Standard Risk Management – Guidelines, (**AS/NZS ISO 31000:2018**) (ISO, 2018). **Figure 72** shows a modified version of the AS/NZS ISO 31000:2018 risk management process diagram to provide a summary on the framework adopted in the development of this EP. To this end, the corresponding sections which address each aspect of the risk management process have also been highlighted.



Source: modified from ISO, 2018

Figure 72 Risk Management Process Adopted from AS/NZS ISO 31000:2018

Some useful definitions for terms which are used throughout the environmental impact and risk assessment are provided in **Table 44**. These terms have been adapted from AS/NZS ISO 31000:2018 and associated Handbook on Environmental Risk Management – Principles and Process (HB 203:2006) (Standards Australia, 2006).

Table 44 Environmental Impact and Risk Assessment Terminology

Term	Synonymous Terms	Description
The activity		An activity or activities which may occur as part of the Otway Basin 3D MC MSS.
Acceptable Level[1]	Acceptable Impact	An 'acceptable level' is the specified amount of environmental impact and risk that an activity may have which is tolerable, is consistent with all relevant principles, and does not compromise the management/conservation/protection objectives of the environment.
As Low as Reasonably Practicable[2]		The operator must show through reasoned and supported arguments that there are no other practicable options that could reasonably be adopted to further reduce risks. Practicable does not mean 'possible' – a decision on whether an option is practicable involves consideration of several factors, including the sensitivity of receiving environment to adverse effects; the financial implications of the option when compared with other options; and the current state of technical knowledge and the likelihood that the option can be successfully applied.
Control Measure[3]		A system, an item of equipment, a person, or a procedure, that is used as a basis for managing environmental impacts and risks. Control measures maintain and/or modify risk
Cost[4]	Sacrifice	The sacrifice required for implementing a control measure, which includes an impost such as the money, time, and/or trouble required to implement a particular control measure. Environmental cost may also be a cost in some circumstances (e.g. dispersant use on an oil spill).
Consequence[1,4,5]		Magnitude/level of effect on the environment in the event that an adverse effect occurs as a result of an activity or incident. For example, loss, injury, or concern. This may be expressed qualitatively or quantitatively.
Effectiveness (*re control measures*)[1]		A measure of how well the control performs the required function and is determined with consideration to aspects of reliability, functionality, survivability, and availability
Environmental Performance Outcome[1]		A specified measurable level of environmental performance that titleholders are seeking to achieve for the life of the activity, and which supports effective management of aspects of an activity to the extent that any associated environmental impacts and/or risks are of an Acceptable Level.
Environmental Performance Standard[1,3]		Parameters which control measures are assessed against to ensure they consistently perform to reduce the impact or risk to ALARP and to an Acceptable Level.
Practicability (*re control measures)*[1]		Practicability is a measure of the risk reduction (benefit) gained from applying the control measure compared to the cost.
Predicted Impact[1,7]	Impact	Actual or potential change to the environment, adverse or beneficial, that is predicted to occur by a proposed activity.

Term	Synonymous Terms	Description
Acceptable Impact[1]	Acceptable Level	An 'acceptable level' is the specified amount of environmental impact and risk that an activity may have which is tolerable, is consistent with all relevant principles, and does not compromise the management/conservation/protection objectives of the environment.
Incident[4]	Event	Any occurrence that can have an adverse impact on the environment. An incident releases the intrinsic potential of a hazard.
Inherent Risk[4]		The untreated risk level.
Likelihood[5]	Probability	The probability that something (e.g. an adverse effect) will occur as a result of an activity. This may be expressed qualitatively or quantitatively.
Measurement Criteria[1]		Define how the environmental performance outcomes and standards will be measured to determine whether the outcomes have been met during the Otway Basin 3D MC MSS.
Receptor[1,4]		A physical, biological, chemical, or social component of the environment which may be subject to an impact.
Risk[4,5]		The chance of something happening that will have an impact on the objectives. It is measured in terms of the consequence should an adverse effect occur and its likelihood of occurring.
Residual Risk[7]		The risk remaining when control measures are in place.
Source of Impact[4]	Stressor Hazard Environmental aspect	An activity or entity that induces an adverse response or impact.

Source of Definitions:

1. NOPSEMA Guidance Note N04750-GN1344 A524696 Environment plan content requirements
2. NOPSEMA Guidance Note N-04300-GN0166 A138249 ALARP.
3. NOPSEMA Guidance Note N-04300-GN0271 A336398 Control measures and performance standards
4. Handbook on Environmental Risk Management – Principles and Process (HB 203:2006) (Standards Australia, 2006).
5. Australian & New Zealand International Standard Risk Management – Guidelines, (AS/NZS ISO 31000:2018)
6. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.
7. NOPSEMA Guideline N-04750-GL1721 A524696 Environment plan decision making

6.1 Identification of Environmental Impacts or Risks

Regulation 13(5)(a) of the Environment Regulations requires an EP to include details of the environmental impacts and risks which may arise as a result of the activity, to establish a link between the proposed activity and the environment that may be affected. On this basis, parts of the activity that interact with the environment and, by extension, those relevant persons/marine users who may use it, were identified with consideration to the following:

- The legislative requirements, guidelines and standards that apply to the Otway Basin 3D MC MSS (**Section 2**);
- A comprehensive description of the activities that will occur during the Otway Basin 3D MC MSS, including timing, and the equipment to be utilised (**Section 3**);
- A comprehensive description of the existing environment that may be affected by the activity, including key sensitivities such as species distributions, subsea habitat, and the location of biologically important areas, protected areas and socio-economic activities which may coincide with the Otway Basin 3D MC MSS identified as part of the desktop studies (**Section 4**); and
- Feedback from relevant persons regarding the socio-economic activities which may coincide with the Otway Basin 3D MC MSS (**Section 5**).

The proposed Otway Basin 3D MC MSS activities have been split into two sub-categories: planned and unplanned activities. Planned activities are defined as those which constitute part of the MSSs approach and are known to occur, whereas unplanned activities are defined as those which have a risk of occurring but are not anticipated to be realised as part of normal operations. It is important to distinguish that planned activities can give rise to both known and potential environmental impacts, whereas unplanned activities can only be associated with potential environmental impacts. This is further described in **Section 6.2.**

The following activities have been considered within this assessment:

- Planned activities (**Section 7**), including:
- Physical presence of the Seismic Vessel and towed equipment (**Section 7.1**);
- Acoustic disturbance to the marine environment (**Section 7.2**);
- Routine permissible waste discharges (**Section 7.3**);
- Atmospheric emissions (**Section 7.4**); and
- Artificial light emissions (**Section 7.5**).
- Unplanned activities (**Section 8**), including:
- Establishment of invasive marine species (**Section 8**);
- Streamer loss (**Section 8.2**);
- Vessel collision or sinking, and its associated potential hydrocarbon spill (**Section 8.2**);
- Hydrocarbon spill response (**Section 8.4**); and
- Accidental release of hazardous and non-hazardous materials (**Section 8.5**).

In addition to the above sub-categories, the potential cumulative impacts and risks which may arise as a result of the Otway Basin 3D MC MSS have been considered within **Section 9**.

6.2 Evaluation of Known and Potential Environmental Impacts and Risks

In accordance with Regulation 13(5)(b) of the Environment Regulations, an EP must include an evaluation of all potential impacts and risks which may arise as a result of the proposed activity, appropriate to the nature and scale of each impact or risk. The purpose of this evaluation is to document the analysis undertaken to establish the environmental impacts and risks in terms of their extent, duration, severity, and certainty in order to demonstrate that the activity can be undertaken in such a way that the environmental impacts and risks will be managed to **ALARP** and an **Acceptable Level** (NOPSEMA, 2022).

To achieve this, the source of impact, pathway through which impacts may be realised and the potential receptors must first be defined. Receptors may include individuals, protected species, populations, habitats, ecosystem functions and socio-economic features or activities. This information forms the basis for which the relative consequence, likelihood and residual risks of impacts can be assessed, in broad accordance with the methods and principles described within the AS/NZS ISO 31000:2018 and HB 203:2006.

The evaluation of known and potential environmental impacts and risks is a systematic process comprising six broad steps. These are described **Table 45** and discussed further in the following sections.

Table 45 Summary of Impact and Risk Evaluation Steps

Section	Description
6.2.1	Assessment of Nature and Scale
6.2.2	Identification of Receptors
6.2.3	Identification of 'Good Practice' Control Measures
6.2.4	Determination of Consequence Rank
6.2.5	Determination of Likelihood Rank
6.2.6	Determination of Residual Risk

6.2.1 Assessment of Nature and Scale

When evaluating the potential impacts and risks which may arise as a result of the proposed activity, the nature and scale of each impact or risk is determined considering:

- The relative sensitivity of the receiving environmental and the resilience to change of the EMBA;
- The type and number of impact pathways;
- The timing, duration and frequency of the impact, with consideration to environmental and ecological seasonal sensitivities (e.g. migratory periods for EPBC Act protected fauna, or high activity periods for commercial fisheries);
- The spatial extent of impacts;
- The severity of impacts (e.g. individual effects, population-level effects, ecosystem effects);
- Potential cumulative impacts; and
- Any uncertainty in the above information.

6.2.2 Identification of Receptors

Based on the descriptions provided in **Section 2** to **Section 5**, the receptors which have been determined as relevant to the Otway Basin 3D MC MSS include:

- Marine environmental quality (water, sediment, air quality);
- Plankton;
- Benthic habitats (Banks, Shoals and Reef);
- Benthic invertebrates;
- Marine fauna;
- EPBC Act listed marine fauna;
- Marine protected areas and sensitive areas;
- Cultural and heritage values (i.e. Aboriginal, European, and marine heritage values);
- Commercial fisheries;
- Commercial shipping;
- Tourism and recreation;
- Divers (commercial and recreational);
- Petroleum exploration and production activities;
- Defence activities; and
- Research activities.

6.2.3 Identification of Legislated and 'Good Practice' Control Measures

In accordance with the Risk Related Decision Making Framework described in the Oil & Gas UK Guidelines on Risk Related Decision Making (Oil & Gas UK, 2014), 'Good Practice' is considered to be the recognised risk management processes and measures which are implemented to manage well-understood impacts and risks generated by an activity. For the purpose of this EP, both legislative requirements and control measures considered to be 'Good Practice' were identified based on the guidance outlined in **Section 2** and with consideration to the Australian IUCN Reserve Management Principles for Commonwealth Protected Areas, relevant Approved Conservation Advice and Recovery Plans, Management Plans and TGS' internal practices.

Where 'Good Practice' is reflected in Australian legislation or relevant Australian Government policies and guidance, these requirements will be applied. When identified in non-regulatory source material, relevant 'Good Practice' will be adopted when feasible and reasonably practicable to implement.

6.2.4 Determination of Consequence Rank

For each receptor predicted to be impacted by a planned or unplanned event, the consequence rank has been determined assuming the credible worst-case impact or risk which may arise if controls fail. The applicable consequence rank is then selected with consideration the scale and duration of effect as described in **Table 46**.

6.2.5 Determination of Likelihood Rank

For each receptor predicted to be impacted by a planned or unplanned event, the likelihood rank has been determined based on historical frequency of analogous events occurring within the industry. The applicable likelihood rank has been selected assuming effective implementation of ‘Good Practice’ control measures, using the criteria described in **Table 47**.

6.2.6 Determination of Residual Impact and Risk

The residual impact and risk assessment has been undertaken to determine the effect of ‘Good Practice’ control measures in mitigating the inherent risk levels, for each receptor predicted to be impacted by a planned and/or unplanned event. Accordingly, the residual impact and risk ranking reflects that risk or impact that remains when all adopted control measures are implemented. The residual impact and risk are determined using the matrix presented in **Table 48**. Corresponding descriptions for each impact and risk ranking, ranging from ‘Negligible’ to ‘Very High’, are provided in **Table 49.**

If the residual risk does not meet the requirements outlined in **Section 6.3** and **Section 6.4**, iterations of the assessment process continue until the residual impact and risk are reduced to an **Acceptable Level** and/or additional controls have been identified and/or rejected or accepted to demonstrate **ALARP**.

Table 46 Criteria for Assessing Potential Consequence Levels

Consequence level	Scale of Effect	Duration of Effect	Effect on Populations & Protected Species and Recovery Period	Effect on Socio-Economic Receptors	Effect on Habitat & Ecosystem Function
0 – Negligible	Highly localised effect (<1 km^2)	Short-term and intermittent/temporary	No predicted adverse effects to populations. Immediate recovery. No protected species impacted.	No disruptions to normal activities. No predicted effects on natural resources or local communities.	Undetectable, affecting <1% of original habitat area. Ecosystem function unaffected.
–1 – Minor	Localised effect (1 – 10 km^2)	Short-term, occurring frequently but ceases when activity ceases	No detectable adverse effect to populations. Rapid recovery would occur (weeks to months). Some individuals of protected species may be impacted.	Short term disruptions to normal activities (weeks to months). Possible minor adverse effects to natural resources and/or local communities.	Measurable but localised, affecting 1 – 5% of original habitat area. Minor changes to ecosystem function.
–2 – Moderate	Medium scale effect (10– - 20 km^2)	Medium-term but ceases when activity ceases	Detectable impacts to populations. Could affect seasonal recruitment but does not threaten long-term viability. Recovery probably measured in months to years. Some population level effects may become apparent for protected species.	Medium-term disruptions to normal activities (months). Moderate adverse effect to natural resource and/or local communities.	Potential impacts more widespread, affecting 5 – 20% of original habitat area. Moderate changes to ecosystem function.
–3 – Severe	Large scale effect (20 – 50 km^2)	Long-term but ceases when activity ceases	Impacts to populations are severe and may limit capacity for population increase. Recovery measured in multiple years. Population level impacts are detectable for protected species.	Long-term disruptions to normal activities (years). Severe adverse effect to natural resources and local communities.	Widespread impacts, affecting 20 – 60% of original habitat area. Severe changes to ecosystem function.
–4 – Major	Very large scale effect (50 – 100 km^2)	Long-term and continues after activity ceases	Long-term viability of populations is clearly affected. Local extinctions are a real possibility if activity continues. Recovery period of decades. Serious conservation concerns for protected species.	Extensive disruptions to normal activities (years to decades). Highly significant and major adverse effects to natural resources and potentially affecting national communities.	Activity may result in major changes to ecosystem or region, affecting 60 – 90% of original habitat area. Major changes to ecosystem function.
–5 – Catastrophic	Regional effect (>100 km^2)	Permanent	Local extinctions are expected in the short-term. Long-term recovery greater than decades and possibly never recovers. Very serious conservation concerns for protected species.	Very extensive disruptions to normal activities (decades). Catastrophic, widespread and potentially irreparable damage to natural resources. Massive negative and potentially irreversible effects on local and national communities, which may not be able to maintain pre-effect livelihood.	Activity will result in critical changes to ecosystem or region, affecting virtually all original habitat. Total collapse of ecosystem.

Table 47 Criteria for Assessing Likelihood of Consequence Occurring

Score/Level	Likelihood of exposure	Historical frequency
–1 – Remote	Highly unlikely but theoretically possible	Unheard of in the industry
–2 – Rare	May occur in exceptional circumstances	Has occurred once or twice in the industry
–3 – Unlikely	Uncommon, but has been known to occur elsewhere	Has occurred more than five times in the industry but not in the company
–4 – Possible	Occurred in a minority of similar studies or projects	Has occurred in the industry and in the company
–5 – Likely	Likely to occur and has generally occurred in similar projects	Has occurred once or twice in the company
–6 – Certain	Could be expected to occur more than once during project delivery	Has occurred frequently in the company

* Whereby 'likelihood' = the likelihood of a consequence occurring from the various activities

Table 48 Overall Residual Risk of Impacts Matrix

		Consequence Level					
		0 – Negligible	1 – Minor	2 – Moderate	3 – Severe	4 – Major	5 – Catastrophic
Likelihood of Consequence	1 – Remote	Negligible (0)	Low (1)	Low (2)	Low (3)	Low (4)	Low (5)
	2 – Rare	Negligible (0)	Low (2)	Low (4)	Moderate (6)	Moderate (8)	Moderate (10)
	3 – Unlikely	Negligible (0)	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
	4 – Possible	Negligible (0)	Low (4)	Moderate (8)	High (12)	High (16)	Very High (20)
	5 – Likely	Negligible (0)	Low (5)	Moderate (10)	High (15)	Very High (20)	Very High (25)
	6 – Certain	Negligible (0)	Moderate (6)	High (12)	Very High (18)	Very High (24)	Very High (30)

Table 49 Residual Risk Ranking and Impact Descriptions

Risk Ranking	Predicted Risk	Predicted Magnitude of Impact
Very High (18 – 30)	Very High Risk – Unacceptable for project to continue under existing circumstances. Requires immediate action. Works should not re-commence until the risk has been reduced to ALARP and an acceptable level. If it is not possible to reduce the risk, work has to remain prohibited.	Very high Impact – Unacceptable for project to continue under existing circumstances. Requires immediate action. Works should not re-commence until the predicted magnitude of impact has been reduced to ALARP and an acceptable level. If it is not possible to reduce the risk, work has to remain prohibited
High (12 – 16)	High Risk – The level of risk is not tolerable and additional control measures are required to reduce the impact/risk, where practicable, to ALARP and an acceptable level.	High Impact – The predicted magnitude of impact is not tolerable and additional control measures are required to reduce the impact/risk, where practicable, to ALARP and an acceptable level.
Moderate (6 – 10)	Moderate Risk – The level of risk is acceptable, providing all practicable controls have been implemented to reduce the impact/risk to ALARP. Requires continued tracking and recorded action plans.	Moderate Impact – The predicted magnitude of impact is acceptable, providing all practicable controls have been implemented to reduce the impact/risk to ALARP. Requires continued tracking and recorded action plans.
Low (1 – 5)	Low Risk – The level of risk is acceptable without further reduction measures being required. Control measures consistent with good industry practice have been applied or have been assumed in the design process. No further development of control measures is required if ALARP.	Low Impact – The predicted magnitude of impact is acceptable without further reduction measures being required. Control measures consistent with good industry practice have been applied or have been assumed in the design process. No further development of control measures is required if ALARP.
Negligible (0)	Negligible Risk – no intervention or further monitoring is required. No detectable environmental impact.	Negligible Impact – no intervention or further monitoring is required. No detectable environmental impact.

6.3 Demonstration of ALARP

In accordance with Regulation 10A(b) and 13(5)(c) of the Environment Regulations, the EP must demonstrate that the environmental impacts and risks of the activity will be reduced to **ALARP**. In practice, this means that all available and effective control measures must be implemented where the cost is not grossly disproportionate to the environmental benefit gained from implementing the control measure. Accordingly, risk treatment involves a cost benefit analysis of alternative, substitute and additional control measures that may further reduce impacts and risks which have not been demonstrated to be ALARP during the evaluation of environmental impacts or risk (**Section 6.2**).

Ideally, the adopted control measures should reduce the residual impact and risk to a Low (or lower) ranking; however, if the impact or risk remains at a higher ranking, it is further assessed to determine whether it has been reduced to **ALARP.**

A systematic approach to demonstration of ALARP has been developed based on the requirements outlined in NOPSEMA Guidance Note ALARP N-04300-GN01660166 A138249 and with consideration to the Risk Related Decision Making Framework described in the Oil & Gas UK Guidelines on Risk Related Decision Making (Oil & Gas UK, 2014).

The Risk Related Decision Making Framework provides for a continuum of 'decision contexts', which comprise a combination of influential factors and constraints within which the decision as to the risk or impact an activity generates is to be made. These factors are broadly summarised as informing a) the type of activity to be undertaken b) the risk and uncertainty and c) the influence of relevant persons. Once the decision context has been defined, the appropriate assessment techniques can be determined. The following assessment techniques may be used for different decision contexts to determine if the activity is being managed to ALARP:

- Good practice: Adherence with recognised guidelines, standards and control measures that are used to manage well-understood impacts and risks is demonstrated;
- Engineering (or Environmental) Impact and Risk assessment: Quantitative analysis is undertaken to increase understanding of the impacts/risks. This may include the application of a range of techniques such as underwater sound modelling or cost benefit analysis; and
- Precautionary approach: Uncertainty is counterbalanced through conservative assumptions which include the 'worst-case' scenario that can be realised. Accordingly, a control measure may be more likely to be adopted.

For the purpose of this assessment, and in accordance with the standard level of approach identified within the approved body of EPs, three 'decision contexts' have been adopted: Type A, B & C (**Figure 73**).

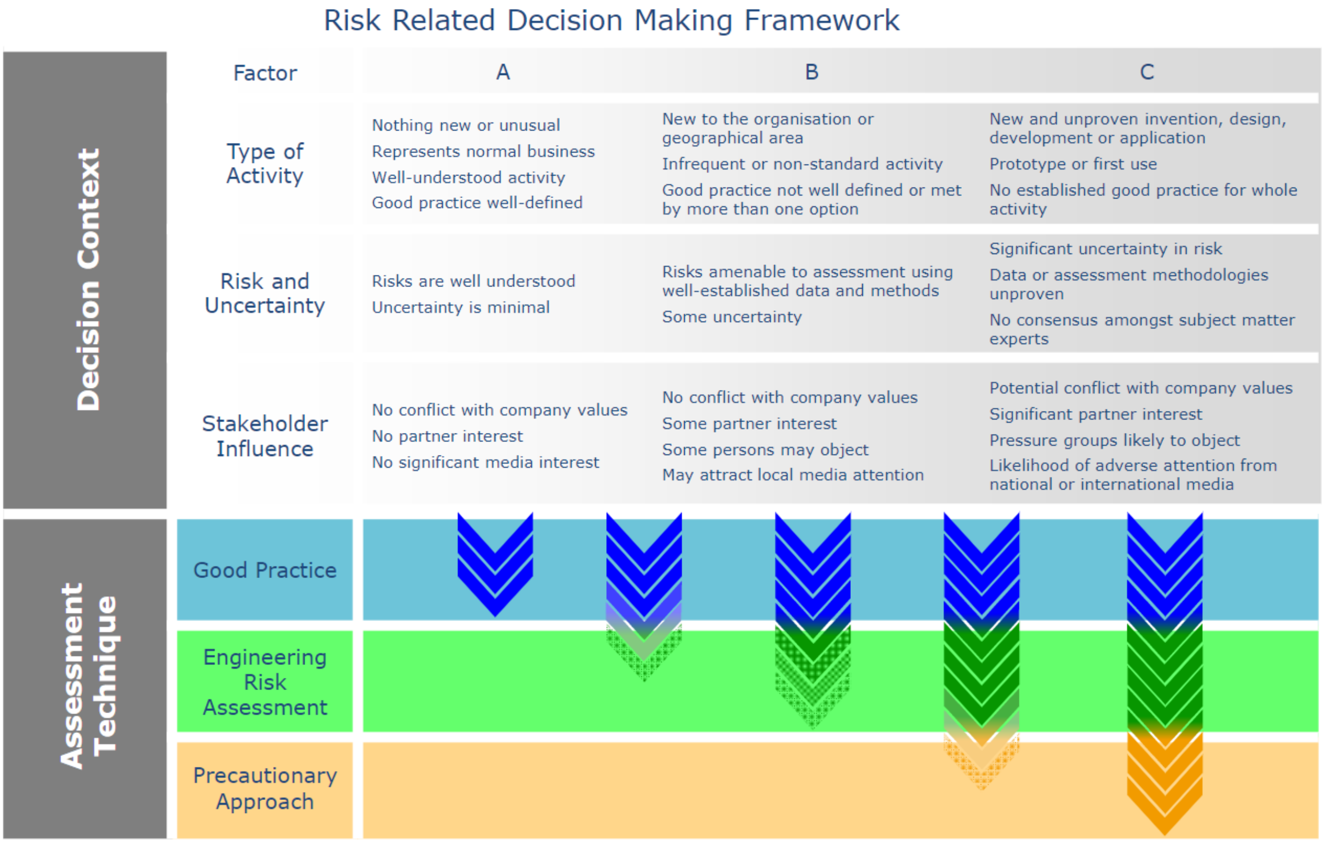


Figure 73 Risk Related Decision Making Framework, Oil & Gas UK (2014)

A description of each 'decision context' and the associated decision methodologies used to demonstrate achievement of ALARP is provided in **Section 6.3.1** to **Section 6.3.3.**

6.3.1 Type A

The decision context is determined to be Type A if the risks and impacts are relatively well understood, with minimal uncertainty and no considerable interest from relevant persons. In general, decision making will be guided by the application of recognised good practice which is well-defined in legislation, standards, and guidelines. Proactive and professional judgement, including utilising industry experience, are sufficient to identify effective control measures and assess adherence to legislative requirements and 'Good Practice'.

If the decision context is categorised as Type A, adherence to all relevant legislation, codes, and environmental standards and 'Good Practice' techniques and controls is considered sufficient to demonstrate the impacts and risks are managed to ALARP. Further assessment, such as an engineering risk assessment, is not necessarily required to identify additional control measures.

6.3.2 Type B

The decision context is determined to be Type B if the risks and impacts involve some uncertainty and greater complexity and generate several concerns from relevant persons. These risks may be novel to the proponent or area, attributed to a non-standard activity and, therefore, good practice is not necessarily well defined. They are typically associated with areas of increased environmental sensitivity.

If the risk is categorised as Type B, an Engineering (or Environmental) Impact and Risk Assessment is required. Additional quantitative analysis is performed, including through the use and interpretation of numerical analysis (e.g. analysis of commercial fisheries catch and effort data) or predictive modelling (e.g. UAM), to further define the risk or impact and cost benefit analysis for adopting further management. The cost benefit analysis is based on a weight of evidence approach to defining the possible environmental benefit gained from adopting alternate, substitute, and additional controls measures, compared to the cost of implementing them.

For the purpose of this EP, the hierarchy of controls, which follows a tiered system of 'eliminate-substitute-reduce-mitigate', has been utilised to identify alternate, substitute and additional controls measures (**Table 50**).

Table 50 General Hierarchy of Controls

Control	Example	Effectiveness
Eliminate	Elimination of the risk or impact, such as eliminating the light source to remove impacts from artificial light emissions.	Most Effective
Substitute	Substitute the method of an activity in favour of a lower impact one, such as substituting Heavy Fuel Oil for MDO to reduce the amount of atmospheric emission.	
Reduce	Reduction of the risk or impact, such as reducing the oil content in discharged water to reduce the potential contamination of the sea.	
Mitigate	Mitigate the potential risk or impact of conducting an activity, such as maintaining separation distances from land when discharging wastes to mitigate the potential impacts on coastal environments	Least Effective

The outcome of the cost benefit analysis determined whether a control measure was considered effective and/or practicable to implement. A clear justification is provided for each determination. Based on this determination, control measures were adopted for implementation or dismissed. ALARP is demonstrated when all available and effective control measures have been considered and implemented, where the cost is not grossly disproportionate to the environmental benefit gained from implementing the control measure.

6.3.3 Type C

The decision context is determined to be Type C if the risks and impacts involve sufficient complexity, uncertainty, and interest from relevant persons to warrant a precautionary approach. The activity may be previously untested, and therefore lack consensus amongst subject matter experts or associated proven risk assessment methodologies. A combination of 'Good Practice', Engineering (or Environmental) Impact and Risk Assessment and Precautionary Approach are required.

ALARP is demonstrated when the precautionary approach is applied, such that it can be shown uncertainty is counterbalanced through conservative assumptions which include the 'worst-case' scenario that can be realised. Safety is expected to take precedence over economic considerations when completing a cost benefit analysis of additional controls.

6.3.4 Identification of Changes to Residual Impact and Risk

Following the ALARP evaluation, any changes to the predicted residual impacts and risks resulting from adopting alternate and/or additional control measures are identified to determine whether potential impacts and risks have been reduced to an acceptable level.

6.3.5 ALARP Statement

ALARP is demonstrated when it is apparent all available and effective control measures have been considered and implemented, where the cost is not grossly disproportionate to the environmental benefit gained from implementing the control measures. A corresponding statement of ALARP is provided for each event to justify the overall certainty and effectiveness of reducing potential impacts and risks to ALARP, using the adopted control measures.

6.4 Impact and Risk Acceptability

Regulation II of the Environment Regulations requires an EP to demonstrate that the environmental impacts and risks of the activity have been reduced to an **Acceptable Level**. Further, regulation 13(5)I states an EP must include details of control measures that will be implemented to achieve this. The criteria used to determine whether the residual risks and impacts of an activity following the implementation of the control measures, and following the demonstration of **ALARP**, are at an **Acceptable Level**, are contained within **Table 51**.

For each criterion, 'acceptability questions' have been developed to assess compliance. Each activity, both planned and unplanned, has been assessed against the relevant criteria within **Sections 7** and **8**.

Impacts and risks classified as Type A are characterised as 'Acceptable' if the level of residual impact and risk are determined to be Moderate or less and compliance with the acceptable impacts stated in **Table 51** can be demonstrated. Impacts and risks classified as Type B or above are characterised as 'Acceptable' if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and residual risk are at or below pre-defined **Acceptable Level** for that impact or risk, including those described in **Table 52**.

Acceptable levels of impact and risk have been developed to protect the values of specific receptors which have been determined as relevant to the routine operations of the activity (**Table 52**). Where risks and impacts are identified as Type B or above, an assessment against these levels has been undertaken to determine whether the predicted impact and risk are below an acceptable level of impact.

Table 51 General Impact and Risk Acceptability Criteria

Criteria	Acceptability Questions	Acceptability is Confirmed
Residual risk ranking	Is the level of residual risk determined to be **Moderate** or less?	The risk has been determined to be **Moderate** or less.
Ecologically sustainable development	ESD is defined as '*using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*'. Section 3A of the EPBC Act sets out three main matters; the first of which is that the activity needs to be carried out in a manner consistent with the principles of ESD. Therefore, ESD is an integral aspect in determining risk/impact acceptability. Based on this, is the management of the risks/impacts associated with the proposed activities carried out in a manner that is consistent with the five principles of ESD as defined within the EPBC Act (**Section 2.1.2**)?	The Otway Basin 3D MC MSS is consistent with the five principles of ESD.

Criteria	Acceptability Questions	Acceptability is Confirmed
TGS' Internal context	Does the management of the risks/impacts associated with the activity align with the internal policy of the titleholder (in this case TGS' policies, **Appendix A**)?	Internal or external audits of procedural systems confirm all policies in place that align with the EP.
Existing environmental context	Has the development of the control measures taken into account the environmental values and sensitivities at a local, regional or global level, where relevant? Are the values and sensitivities of the environment, including matters protected under Part 3 of the EPBC Act (World Heritage, National Heritage, Wetlands of International Importance, Listed threatened species and ecologically communities, Listed migratory species, Commonwealth Marine Environment) protected so that no significant impacts result to the environment?	With the implementation of the control measures, the potential impacts from each of the activities must be consistent with the general nature and quality of the receiving environment of the OA and EMBA.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	Is the management of the impacts/risks in accordance with the relevant species specific or protected area management plans, such as Conservation Advice, Management Plans, or Recovery Plans? Are the risks/impacts managed in alignment with the nominated conservation values defined within the South-east Marine Region Profile?	With the implementation of the control measures, the potential impacts from each of the activities must be consistent with all of the relevant management plans, conservation advice, recovery plans.
Social Acceptance – Relevant persons expectations	Have any concerns regarding the risks/impacts which may arise from the activity been raised through consultation (described throughout **Section 5** and **Appendix G**) with relevant persons. If so, have the merits of these concerns been evaluated? Where it has been determined that the concerns have merit, have any relevant control measures been developed to address these concerns?	All relevant persons concerns and submissions have been responded to, adequately addressed and closed out.
External Context – Commonwealth and State Legislative Criteria	Does the management of the risks/impacts (including the proposed control measures) associated with the activity align with the relevant Australian and International legislation, conventions, and standards such as those outlined within **Section 2** (i.e. Policy Statement 2.1, MARPOL, Marine Notices, Marine Orders)?	Compliance with all of the legislative requirements, standards and policies and can be demonstrated when audited.
Industry best practice	Has the management of the risks/impacts been conducted in accordance with industry best practice, such as the APPEA Code of Environmental Practice and IAGC Environmental Manual for Worldwide Geophysical Operation?	The impact of potential risk, through control measures is managed so that it is compliant with all relevant industry best practice guidelines.
ALARP	Are all reasonable and practicable control measures in place to reduce the impact or risk of the activity? Have the costs (financial or otherwise) of implementing further control measures been considered? Where it is considered that costs are disproportionate to the benefit gained, has this been identified?	General agreement that the residual risk from the Otway Basin 3D MC MSS has been demonstrated to be **ALARP**.

Table 52 Specific Impact and Risk Acceptability Criteria

Criteria	Acceptable Level	Acceptability is confirmed
Marine Environmental Quality	There are no long-term or widespread impacts to the quality of water and sediment.	Predicted impacts to water and sediment quality are short-term and localised.
Plankton	Impacts to plankton communities are localised (within 100s of m from the acoustic source) and recoverable (< 1 week to recover). Note that the latter is considered sufficient to protect against population level impacts and impacts to the recruitment levels at surrounding habitats.	Predicted impacts to plankton communities do not extend beyond the spatial and temporal limits defined within the acceptable level.
Benthic Habitats (Banks, Shoals and Reef)	No detectable impacts to habitat forming benthic primary producers, such as coral, as a result of the Otway Basin 3D MC MSS.	No impacts to habitat forming benthic primary producers are predicted
Benthic Invertebrates	Impacts to crustaceans and bivalves arising from the Otway Basin 3D MC MSS will not result in mortality rates beyond the natural range of variation.	Predicted impacts to crustaceans and bivalves do not indicate mortality rates beyond the natural range of variation.
Non-Listed Marine Fauna (Cephalopods, Fish, Sharks, Rays)	No serious[12] or irreversible damage to a population of any Non-listed marine fauna species as a result of the Otway Basin 3D MC MSS.	No serious or irreversible damage to a population of any Non-listed marine fauna species as a result of the Otway Basin 3D MC MSS.
EPBC Act Listed marine fauna (Marine Turtles, Marine Mammals, Seabirds)	Impacts to EPBC Act Listed marine fauna are limited to minor, short term effects to individuals and do not preclude the continuation of biologically important behaviours, within and outside nominated BIAs.	Predicted impacts to marine fauna are limited to minor, short term effects do not preclude the continuation of biologically important behaviours within and outside the nominated BIAs.
Marine Protected Areas and Sensitive Areas	Meet the Zeehan AMP and Nelson AMP IUCN Category VI (Multiple Use Zone) objective to provide for ecologically sustainable use while conserving ecosystems, habitats and native species. The Otway Basin 3D MC MSS is undertaken in a manner consistent with the requirements of the South-East Commonwealth Marine Reserves Network Management Plan 2013 - 23. The ecosystem function and integrity of Commonwealth Marine Areas are maintained.	Predicted impacts to Marine Protected Areas/Sensitive Areas do not compromise the ecosystem function and integrity of Marine Protected Areas/Sensitive Areas or conservation status of native species within Marine Protected Areas/Sensitive Areas. Predicted impacts do not compromise the ecosystem function and integrity of Commonwealth Marine Areas.

[12] In the absence of a definition of 'serious' environmental damage in relation to the Principles of ESD under the EPBC Act, TGS considers a serious impact to be impacts with the potential to result in a threat to population or community viability.

Criteria	Acceptable Level	Acceptability is confirmed
Cultural Heritage Values	No interference with other relevant persons/marine users, including access by traditional owners, to an extent greater than is necessary for the exercise of right conferred by the titles granted.	Predicted impacts to access and use (e.g. fishing) are managed such that they are not greater than is necessary for the exercise of right conferred by the titles granted.
Commercial Fisheries	No interference with other relevant persons/marine users to an extent greater than is necessary for the exercise of right conferred by the titles granted. No change to the sustainability status of the fishery; the Otway Basin 3D MC MSS is undertaken in a manner that does not result in serious, irreversible or long-term impacts to key indicator commercial fish populations and to the extent that sufficient spawning fish biomass and recruitment of the stocks may be maintained such that stocks continue to be assessed as sustainable. There is no increased costs or loss of income for commercial fishing license holders.	Predicted impacts to access and use are managed such that they are not greater than is necessary for the exercise of right conferred by the titles granted.
Commercial Shipping	No disturbance to shipping outside the extent of the (10 km) caution zone.	Impacts to shipping are not predicted to occur beyond the (10 km) caution zone.
Tourism and Recreation	No disturbance to tourism and recreation activities outside the extent of the (10 km) caution zone or to a degree exceeding that previously agreed to be an acceptable level of disruption to tourism operators and recreational users.	Impacts to Tourism and Recreation are not predicted to occur beyond the (10 km) caution zone or to a degree exceeding that previously agreed to be an acceptable level.
Divers	No health impacts to divers or underwater recreational activities as a result of the Otway Basin 3D MC MSS.	There are no predicted health impacts to divers or recreational users as a result of the Otway Basin 3D MC MSS.
Petroleum exploration and production	No entry into established Petroleum Safety Zones surrounding petroleum installations and equipment.	There is no unpermitted entry into established Petroleum Safety Zones surrounding petroleum installations and equipment.
	No disturbance to SIMOPS outside the extent of the (10 km) caution zone or to a degree exceeding that previously agreed to be an acceptable level of disruption to petroleum exploration and production vessel activities.	Impacts to SIMOPS are not predicted to occur beyond the (10 km) caution zone or to a degree exceeding that previously agreed to be an acceptable level.
	Where the potential for concurrent MSSs to occur is identified, SIMOPS planning will include the implementation of a 40 km spatial separation between the Seismic Vessel and any other operating Seismic Vessel in the Otway Basin area.	A 40 km spatial separation is maintained between the Seismic Vessel and any other operating Seismic Vessel in the Otway Basin area.

Criteria	Acceptable Level	Acceptability is confirmed
Defence activities	No disruption to known defence activities or damage to UXOs	No impacts to known defence activities are predicted.
Research Activities	No disturbance to Research Activities outside the extent of the (10 km) caution zone or to a degree exceeding that previously agreed to be an acceptable level of disruption to Researchers.	Impacts to Research Activities are not predicted to occur beyond the caution (10 km) zone or to a degree exceeding that previously agreed to be an acceptable level.

TGS considers an impact or risk to be unacceptable where the residual risk or impact attributed to a planned or unplanned event is High or greater, or, where the assessment shows the defined **Acceptable Level** cannot be met. In these cases, TGS will not undertake the activity until such a time where the residual impact and risk ranking are reduced to Moderate or below, or it can be demonstrated that the defined **Acceptable Levels** can be met.

6.4.1 Acceptability Statement

Following demonstration that all effective and practicable control measures have been adopted to reduce the impacts and risks to **ALARP**, compliance with the pre-defined (general and/or receptor specific) **Acceptable Levels** of impact has been assessed. A corresponding statement is provided for each event to justify the outcome of this assessment.

6.5 Environmental Performance Outcomes and Standards

Regulation 13(7)(a–c) of the Environment Regulations requires every EP to:

- Set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured;
- Set environmental performance standards for the control measures; and
- Include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is met.

Environmental performance outcomes (**EPOs**) are a specified measurable level of environmental performance that titleholders are seeking to achieve for the life of the activity. The EPOs developed are designed to support the effective management of aspects of an activity to the extent that any associated environmental impacts and/or risks are of an **Acceptable Level**. To this end, the EPOs should be equivalent to or better than the acceptable levels(s). Each activity associated with the Otway Basin 3D MC MSS will include an environmental performance outcome which relates to all the environmental features that may be impacted or are at from the occurrence of the activity.

Environmental performance standards (**EPSs**) relate specifically to the performance of a control measure. They are parameters which control measures are assessed against to ensure they consistently perform to reduce the impact or risk to **ALARP** and to an **Acceptable Level**. These EPS' set levels at which an incident becomes a 'recordable incident' (**Section 10**) and will be utilised as part of performance monitoring of the Otway Basin 3D MC MSS.

Measurement criteria define how the environmental performance outcomes and standards will be measured to determine whether the outcomes have been met during the Otway Basin 3D MC MSS.

7 Environmental Impacts and Risks from Planned Activities

This section describes the results of the impact and risk assessment for planned activities using the methodology described throughout **Section 6** and identifies the control measures that will be in place to reduce the impacts and risks associated with the Otway Basin 3D MC MSS to **ALARP** and to an **Acceptable Level**.

The impact and risk assessment has been undertaken for each planned activity are listed in **Table 53**.

Table 53 Planned Activities Assessed

Planned activity	Section reference	Residual risk
Physical presence of Seismic Vessel and towed equipment	**Section 7.1**	**Low**
Acoustic disturbance to the marine environment	**Section 7.2**	**Moderate**
Routine permissible waste discharges	**Section 7.3**	**Negligible**
Atmospheric emissions	**Section 7.4**	**Negligible**
Artificial light emissions	**Section 7.5**	**Low**

7.1 Physical Presence of Seismic Vessel and Towed Equipment

7.1.1 Description of Source of the Impacts and Risks

The risk of a vessel collision or entanglement with marine fauna and other marine users is limited to the footprint of the vessel and towed equipment. During the Otway Basin 3D MC MSS, the Seismic Vessel will tow a suite of equipment including the acoustic source at a depth of 6—8 m below the surface, and up to 14 streamers. Each streamer will be 8 – 10 km in length and will be towed at 10 – 30 m below the surface. Streamers will have a lateral spread of 800 – 1,600 m. Each streamer will be equipped with a tail buoy that has a radar reflector and light at the terminal end. A detailed description of the proposed activity and schematic diagram showing the general configuration of towed gear is provided in **Section 3** and **Figure 3**.

A purpose-built Seismic Vessel will be contracted for the Otway Basin 3D MC MSS that is capable of safely operating in the environmental conditions of the Otway Basin. The Seismic Vessel will be accompanied by at least one support vessel, which will manage potential interactions between the Seismic Vessel and other marine users. The Seismic Vessel and support vessel/s are collectively referred to as the ‘survey vessels’, where appropriate, throughout this section.

7.1.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 54**.

Table 54 Environmental Receptors Assessed

Receptor	Section reference
Marine Reptiles	**Section 7.1.2.1**
Marine mammals (cetaceans and pinnipeds)	**Section 7.1.2.2**
Seabirds	**Section 7.1.2.3**
Protected areas	**Section 7.1.2.4**

The physical presence of the survey vessels and towed acoustic equipment has the potential to result in the following effects on environmental receptors, including those that are recognised as key sensitivities within the protected areas that overlap with the OA:

- Disruption to normal animal behaviours;
- Displacement of animals from preferred habitat; and
- Collision with or entanglement of animals in towed equipment.

7.1.2.1 Marine Reptiles

Three species of threatened marine turtle are known to occur, or may occur, within the OA (**Table 24**): loggerhead turtle, green turtle, and leatherback turtle. The greatest potential consequence to these marine reptiles from the physical presence of the survey vessels and towed equipment, is collision or entanglement.

Turtles are vulnerable to vessel strike due to their relatively small size and the significant amount of time spent just below the sea surface (Commonwealth of Australia, 2017a). Peel *et al*. (2016) reviewed vessel strike data (2000 – 2015) for marine turtles in Australian waters and identified that all marine turtle species present in Australian waters have had interactions with vessels, with green and loggerhead turtles (both of which may occur within the OA) exhibiting the highest incidence of interactions.

Tail buoys are the most likely part of the towed equipment to trap marine turtles. There are two main areas on the tail buoy which may trap turtles: between the buoy and the connecting chains (the most common area of entrapment), or underneath the buoy in the ‘undercarriage’ structure (Ketos Ecology, 2009). To become trapped in the tail buoy, the animal would have to come in close proximity to the buoy. There are two theories as to why turtles become trapped against tail buoys: startle diving in front of the towed equipment, or while foraging along the streamers (Ketos Ecology, 2009). Entanglement in tail buoys would be fatal due to water movement holding the turtle against the buoy, keeping the turtle from being able to reach the surface to breathe (Ketos Ecology, 2009).

Collision avoidance is determined by the animal’s response time, which is affected by both vessel speed and visibility. Hazel *et al*. (2007) found that 60% of green turtles were able to successfully flee from approaching vessels travelling at two knots (3.76 km/hr). A turtle’s ability to flee was severely reduced as vessel speed increased, with 22% of turtles successfully fleeing at six knots (11.1 km/hr) and only 4% at ten knots (18.5 km/hr). The authors concluded that most turtles cannot avoid vessels travelling at speeds greater than two knots (Hazel *et al.,* 2007). Turtles are likely responding to visual cues of the approaching vessel, not sound cues; if turtles were relying on sound, the reverse result would occur with greater response rates to faster (i.e. louder) vessel approaches (Hazel *et al*., 2007).

Surface behaviours of marine turtles increase the chance of entrapment. Those basking at or just below the sea surface in hot and calm conditions react slowly to oncoming threats, with dive reactions occurring at close range based on visual detection of the threat (Ketos Ecology, 2009). Startle responses in animals undertaking such behaviours in response to approaching vessels have been observed at as little as 1 m from the threat (Weir, 2007). All species of marine turtle potentially present within the OA exhibits basking behaviours.

There are no peer-reviewed literature documenting incidences of marine turtle entanglement; however, there are anecdotal reports of marine turtles off the west coast of Africa, leading to the development of ‘turtle guards’ (Nelms *et al.,* 2016). Turtle guards are fitted to the buoy and act as a physical barrier to exclude turtles from the space between the buoy and undercarriage (Ketos Ecology, 2009). Certain designs may also allow the turtle to be deflected away from the buoy. All tail buoys utilised in the Otway Basin 3D MC MSS will be fitted with a turtle guard unless the tail buoys are of a design that does not represent an entrapment risk to marine turtles.

The '*National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna'* provides a guiding framework for mitigating the risk of vessel collisions with marine megafauna, including marine turtles (Commonwealth of Australia, 2017a). An intended outcome of this document is the development of a mitigation measures 'toolkit'. To date this toolkit has not yet been developed.

There are no mitigation measures that will be implemented on board the Support Vessel to minimise the risk of collision with marine turtles; however, the installation of turtle guards on tail buoys or use of buoys of a design that does not represent an entrapment risk to marine turtles, and the slow speed of the Seismic Vessel are considered to be effective measures against ship strike and entanglement for marine turtles. Any incidents with turtles will be reported, as recommended under the National Strategy.

Disruption to normal animal behaviours and displacement from preferred habitat due to vessel disturbance is particularly an issue for turtles in foraging habitats and nesting areas, particularly in shallow coastal areas where vessel traffic is typically high (Commonwealth of Australia, 2017a). Much of the OA is in water depths greater than 400 m which is typically outside of the preferred depth range for marine turtles. Furthermore, there are no marine turtle BIAs within either the OA or the wider EMBA, therefore the OA has not been identified as being particularly important habitat for marine reptiles and disruption of marine turtles from preferred habitat will not occur during the Otway Basin 3D MS MSS.

The residual risk to marine turtles arising from the physical presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.1.2.2 Marine Mammals

Disruption of normal animal behaviour and displacement is of particular concern when it occurs frequently or over a prolonged period and affects critical behaviours such as feeding, breeding, and resting. The physical presence of the survey vessels and towed equipment may cause some temporary and localised changes in marine mammal behaviours and/or displacement from habitat. **Table 37** provides a summary timeline depicting the expected presence of marine mammals in the OA.

The reaction of marine mammals to the approach of a vessel is variable, however, marine mammals generally show two stereotypical behaviours in the presence of vessels: avoidance or attraction (Wűrsig *et al*., 1998); both behaviours can affect energy expenditure and disrupt natural activities. Avoidance most commonly leads to an animal becoming displaced from an area; however, such disturbance is predicted to be temporary due to the transitory and temporary duration of seismic activities in any single location. Furthermore, marine mammals must be in relative proximity to the vessels and equipment to be affected by their physical presence. Whales generally do not approach moving ships, while dolphins may bow ride vessels depending on the species, their behaviour, and the vessel type.

Collisions between vessels and marine mammals occur more frequently where high vessel traffic and important habitat coincide. Vessel strike incidents involving whales have been reported from all areas of the Australian coastline except for the northern coast, where population density, vessel traffic, and the number of whales present are relatively lower (Peel *et al*., 2018). The timing of reported vessel strike incidents tends to match the migratory patterns of the species involved, for example, incidents involving SRWs in Australia peak in August, corresponding to when this species is migrating and/or have reached mating/calving grounds close to the Australian coastline (Peel *et al.,* 2018).

The Commonwealth of Australia (2017b) reports that there were 109 records of ship strike on cetaceans in Australian waters from 1997 to 2015. Species affected included humpback (47%), SRW (13%), sperm (3%), PBW (2%), BW (2%), pygmy sperm (2%), dwarf minke (2%), pygmy right (1%), fin (1%), Antarctic minke (1%), and 'unidentified' (26%) whales (Commonwealth of Australia, 2017b). Peel *et al*. (2018) revised this data and added to it by searching media archive databases and revealed an additional 76 unreported vessel strike records between 1877 and 2015. Overall, Peel *et al.* (2018) concluded that of the 'known' species in the Australian ship strike record, humpback whales (59%), SRWs (14%), and sperm whales (8%) were the most encountered species. Incidents typically occurred within each species' core distribution (for SRWs and sperm whales this was confined to the southern half of Australia) and there was a strong temporal correlation between ship strike and migration periods for humpback and SRWs. Globally, the species most affected by vessel strike are fin whales, humpback whales, right whales, gray whales, minke whales, sperm whales and BWs (Jensen *et al*., 2004).

Laist *et al.* (2001) suggested larger vessels (i.e. container vessels and fast ferries) moving faster than 10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling at speeds greater than 14 knots. Vanderlaan and Taggart (2007) found the greatest increase in probability of lethal injury to a large whale involved in a ship strike incident was between vessel speeds of 8.6 and 15 knots. Individual cetaceans engaged in behaviours such as feeding, mating, or nursing may also be more vulnerable to vessel collisions when distracted by these activities (CoA, 2017b). Peel *et al*. (2018) collated all known reports of vessel strike on whales in Australian waters and found over half of reports (53%) for where the outcome of the interaction was known were fatal or likely fatal for the animal involved. Fatalities often occurred due to interactions with the propeller of larger vessels (Peel *et al*., 2018). During data acquisition, seismic vessels typically travel at approximately 4 – 5 knots; three to four times slower than the mean fatal speed documented by Jensen *et al*. (2004). Records of sub-lethal effects are less reliable on account of the difficulty in assessing injury in free swimming cetaceans following a collision.

Jensen *et al*. (2004) demonstrated that vessel type plays a role in the likelihood of a ship strike resulting in animal mortality. In a review of the global ship strike database, most fatal strikes were caused by navy vessels and container/cargo ships/freighters, which typically travel faster than 15 knots. Seismic vessels (categorised in the study as 'research' vessels) accounted for only one ship strike incident from a total of 292 reported incidents (Jensen *et al*., 2004).

There are 26 cetacean species identified within the EPBC Act Protected Matters Search as having a potential presence within the OA (see **Table 25**). The OA overlaps with PBW distribution and foraging BIAs (**Figure 23**), and the known core range and aggregation areas (identified as BIAs) for SRWs (**Figure 24**). Based on the assessed likelihood of encountering each cetacean species during the Otway Basin 3D MC MSS, ship strike is of most concern for BW, fin, sei, SRW, humpback, and pygmy right whales which are known or likely to occur in the OA.

While PBWs are not well represented in the Australian ship strike records, collisions do occasionally occur. Strandings of BWs with suspected vessel strike injuries were recorded in VIC near the Bonney Upwelling in 2009 – 2010, with increased recreational fishing at continental shelf waters off Portland increasing the potential for collisions to occur (DoE, 2015b). BWs have been shown to have limited ability to adjust their response behaviour to approaching ships, with McKenna *et al.* (2015) reporting BWs with relatively slow descents and no horizontal movements away from a ship in their study. Owen *et al.* (2016) also found BWs dived to a mean depth of ~13 m while on migration, spending 94% of observed time within the range of large container ship drafts (<24 m), although it is unclear how diving behaviour differs for foraging whales.

SRWs are vulnerable to entanglement and vessel collision as they spend significant portions of the year in coastal waters where human activities are most concentrated. This is of relevance to the Otway Basin 3D MC MSS with the identification of coastal waters between Sydney and Perth as a core range BIA. During experimental approaches of a research vessel towards SRWs off the coast of Argentina, Argüelles *et al.* (2021) found differing responses of SRWs depending on the number of whales present. The authors concluded that the probability of a SRW responding to a transiting vessel is low, unless there are only a few whales in a group, or it is a mating group, as the approaching vessel was not perceived as a threat (Argüelles *et al.,* 2021). Due to the distance offshore of the OA, the SRWs encountered during the Otway Basin 3D MC MSS will likely be adult whales and densities will be very low. Based on the findings of Argüelles *et al.* (2021), these whales may show slow or reduced responses to the approaching Seismic Vessel.

TGS will implement additional controls to mitigate against effects of the Otway Basin 3D MC MSS on BW/PBWs and SRWs. These controls include both spatial and temporal restrictions for acquisition in and around the BW/PBW foraging BIAs and SRW Aggregation BIA (as depicted in **Figure 23** and **Figure 24** respectively), which have been identified as key sensitivities for these species. Of particular note are the following spatio-temporal controls that reduce the overlap between seismic operations and elevated seasonal densities of these key threatened species:

- No acquisition will occur within the BW/PBW BIAs or a 16 km buffer during the 'peak feeding season' from January to June (inclusive) based on the expected consistent and widespread presence of whales in the foraging areas during these months (Gill *et al*., 2011; 2015; McCauley *et al*., 2018). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions and will only take approximately 12 hours to acquire.
- No acquisition will occur within the SRW Ag BIA or a 42 km buffer during the core aggregation months of May to September (SWIFFT, 2023) and no exceptions will be permitted.

These control measures have been further described within **Section 7.2** and the associated control measure and EPS tables pertaining to potential effects of acoustic emissions on marine mammals.

The slow operational speed of the Seismic Vessel and the presence of MFOs onboard will also serve as strong control measures against any potential ship strikes.

Smaller dolphin species are highly agile and are significantly less likely to collide with larger vessels (Van Waerebeek *et al*., 2007) and as a result vessel strike for these species during the Otway Basin 3D MC MSS isa remote concern.

Minimising vessel collision is ranked as a high priority action within the Conservation Management Plans for BWs and SRWs, and within the Conservation Advice for fin, sei, and humpback whales. The expected low incidence of vessel strike from the Otway Basin 3D MC MSS will not affect the long-term recovery of these species in accordance with these plans.

The '*National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna*' acts as a guiding framework for identifying the species and areas most at risk and aims to provide appropriate control measures to reduce the risk of ship strike. The National Strategy intends to develop a 'mitigation measures toolkit'. To date this toolkit has not been developed; however, once developed the control measures for cetaceans will fall into three main categories: keeping vessels away from whales, slowing of vessel speeds, and implementation of avoidance manoeuvres (Commonwealth of Australia, 2017b).

The master of the Support Vessel will operate in accordance with the EPBC Regulations Part 8, Division 8.1 in regard to the minimum approach distances and vessel speed for "other craft" and follow the prescribed actions when adult cetaceans and/or calves are present within the caution zone[13]. These control measures are included in **Table 84**. In particular, EPBC Regulations Part 8, Division 8.1 requires the Vessel Masters of the Support Vessel/s to:

- Take action to avoid approaching or drifting closer than 50 m to an adult dolphin or 100 m to an adult whale;
- Take action to avoid approaching or drifting closer than 150 m to a dolphin calf or 300 m to a whale calf; and
- Not exceed a speed of 6 knots within the caution zone of a cetacean (300 m).

If the cetacean shows any sign of being disturbed, the vessel must be withdrawn from the caution zone at a speed of less than 6 knots. If an adult whale approaches the Support Vessel or comes within 100 m, the master must disengage the gears and let the whale approach or reduce the speed of the vessel and continue on a course away from the whale. If an adult dolphin approaches the Support Vessel or comes within 50 m, the master must not suddenly change course or speed of the vessel. The master of the Support Vessel will make all efforts not to let a calf enter the caution zone; however, if a calf does enter the caution zone, then the master will immediately stop the vessel, turn off the vessel's engines, or disengage the gears, or withdraw the vessel from the caution zone at a constant speed of less than 6 knots.

Due to the restricted manoeuvrability of the Seismic Vessel, no further mitigation measures can be applied to reduce the risk of ship strike from the Seismic Vessel; however, the Seismic Vessel will maintain speed and course in the presence of marine mammals, this, in addition to the already low speed of the vessel, allows greater time for individuals to detect the vessel, predict its pathway, and avoid a collision or entanglement in the towed equipment. Trained observers will be on-watch while the Seismic Vessel is acquiring during daylight hours. While this will not minimise the potential for vessel strike, any incidents (i.e. ship strike or entanglement) will be observed and reported. Ship strikes will be reported into the Australian Government National Ship Strike Database, as is required by the EPBC Act.

A foraging BIA for male Australian sea lions is located 97 km from the northwest boundary of the OA. This species generally feeds on the continental shelf, most commonly in depths of 20 – 100 m, and travel a maximum distance of around 190 km when over shelf waters (Shaughnessy, 1999). Although Australian sea lions have been identified within the Protected Matters Report as present within the OA, given the distance of the OA from the foraging BIA and from the main breeding colonies at Pages Islands (over 360 km) and Seal Bay (over 400 km), it is unlikely that Australian sea lions will be encountered in the OA.

Although some marine mammals could interact with and become entangled in the towed equipment, it is highly unlikely that this would occur on account of marine mammals displaying exceptional abilities to detect and avoid obstacles in the water column and there being no loose surface lines associated with the towed equipment (Rowe, 2007). To TGS' knowledge, there has never been a reported case of a marine mammal becoming entangled in seismic equipment. In addition, the auditory range of many cetaceans overlaps with peak intensities of transiting ships, thus cetaceans should have the capacity to acoustically detect an oncoming ship (Allen and Peterson, 2012) and move away from the vessel/s, minimising the likelihood of a ship strike and entanglement.

[13] 150 m radius around a dolphin, and 300 m radius around a whale

The presence of the vessels may also act as an attractant to certain species, particularly smaller species of dolphin which may approach the vessel to bow-ride (Wűrsig *et al*., 1998). Bow-riding behaviours have been observed during periods of active seismic acquisition (e.g. Moulton and Miller, 2005). However, the seismic array is located a reasonable distance behind the bow waves that small dolphins like to play in.

As a result, the risk to marine mammals arising from the physical presence of the survey vessels and the towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.1.2.3 Seabirds

Seabird interactions with vessels are relatively common in marine waters. While most interactions are harmless, some can be detrimental and may cause injury or death (e.g. bird strike). Seabird shave been shown to respond to vessels by avoidance of heavily used areas and disruption of feeding behaviours (Schwemmer *et al*., 2011; Velando and Munilla, 2011; Ronconi *et al*., 2015).

Several seabird species identified as potentially present within the OA are known to follow vessels due to a learned association of vessels as a food source (e.g. fishing vessels discarding fish offal). These include several species of albatrosses, petrels, and shearwaters. These species tend to follow the vessel and are therefore unlikely to collide with the moving vessel.

The risk of vessel collision or entanglement with towed equipment is limited to the footprint of the survey vessels, which is temporary in nature at any one position as the vessels transit the OA. The Seismic Vessel will be operating at low speeds while acquiring data for the Otway Basin 3D MC MSS, and as such, it is expected that most seabirds in the vessel's path will relocate to avoid collision as is typical of most interactions between vessels and seabirds. The OA overlaps with foraging BIAs of 12; however, the area of displacement will be small compared to the wider surrounding habitat and foraging birds will be able to continue exhibiting foraging behaviours immediately following the passage of the survey vessels.

Potential impacts of the acoustic source on seabirds and their prey (i.e. fish and zooplankton) are assessed throughout **Section 7.2**. Potential impacts from artificial light, including attraction of seabirds to the vessels and associated risk of vessel strike are assessed in **Section 7.5.2.4**.

The residual risk to seabirds arising from the physical presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.1.2.4 Protected Areas

The OA overlaps the boundaries of two AMPs (the Zeehan and Nelson AMPs) and one KEF (the West Tasmania Canyon KEF).

Key sensitivities within the West Tasmania Canyon KEF are primarily associated with the benthic environment and therefore will not be impacted by the physical presence of the survey vessels and towed equipment. Potential impacts on the benthic environment relating to an accidental streamer loss are assessed in **Section 8.2**.

Key sensitivities within the Zeehan AMP include benthic habitats, migrating blue and humpback whales, and foraging seabirds (black browed, wandering, and shy albatrosses, great winged petrels, and cape petrels), while sensitivities within the Nelson AMP include benthic habitats and migrating blue, humpback, fin, and sei whales. Benthic sensitivities within the AMPs will not be affected by the physical presence of the survey vessels and towed equipment. Potential impacts on marine mammals and seabirds from the physical presence of the survey vessels and towed equipment are addressed in **Section 7.1.2.2** and **Section 7.1.2.3** respectively.

The South-East Commonwealth Marine Reserves Network Management Plan 2013 – 23 has identified noise pollution associated with shipping/other vessels, and oil pollution associated with other vessels as sources of pressure on the conservation values of the AMPs within the SEMR; however, vessel transit is an allowed activity under Part 5 of the plan as it is an activity that is known to be likely to have minimal, if any impact on the values of the network management zones. Potential impacts from noise pollution and oil pollution as a result of the Otway Basin 3D MS MSS are addressed in **Section 7.2** and **Section 8.3** respectively.

7.1.3 Evaluation of Known and Potential Impacts and Risks to Relevant Persons and Marine Users

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 55**.

Table 55 Relevant Persons and Marine Users Assessed

Receptor	Section reference
Commercial Fisheries	**Section 7.1.3.1**
Commercial Shipping	**Section 7.1.3.2**
Tourism and Recreation	**Section 7.1.3.3**
Petroleum Exploration and Production	**Section 7.1.3.4**

The physical presence of the survey vessels and towed acoustic equipment has the potential to result in the following effects on relevant persons and other marine users:

- Displacement of marine users from regular routes or activity areas; and
- Collision with or entanglement of marine users with survey vessels and/or towed equipment.

The effects of displacement on relevant persons and other marine users due to an oil spill have been assessed in **Section 8.3** and **Section 8.4** (clean up response).

7.1.3.1 Potential Impacts and Risks to Commercial Fishing Operations

The following represent the potential impact pathways commercial fishers could be affected by the presence of the survey vessels and towed equipment:

- Temporarily exclusion of fishers from fishing grounds and inconvenience to fishers as they will need to plan their fishing operations around the planned survey routes, with potential additional costs incurred (e.g. additional fuel use, crew wages etc.); and
- Requirement to remove or delay the setting of fishing equipment within the OA during the acquisition period.

While towed equipment is deployed, the Seismic Vessel will be restricted in its ability to manoeuvre while moving at a speed of 4 to 5 knots. The limited manoeuvrability of the Seismic Vessel prevents active avoidance of fishers and fishing gear in the water and means that commercial fishing vessels may be asked to take measures to avoid the immediate vicinity of the Seismic Vessel and associated towed equipment. For commercial fishers this could result in operational inconveniences (e.g. manoeuvring around the Seismic Vessel and requested area of avoidance) and temporary loss of access to fishing areas (i.e. displacement). Displacement could result in reduced catches and income and/or increased costs to operate elsewhere (i.e. relocation costs). Vessels will be requested to provide a wide berth of 3 NM (5.5 km) ahead, on both sides, and astern of the Seismic Vessel and towed equipment. In addition, commercial fishers may be asked to remove deployed fishing gear such as pots and lines to avoid interaction with the Seismic Vessel and towed equipment. Fishers will continue to be able to fish within the OA; however, they will be temporarily impacted by the physical presence and buffer zone imposed around the Seismic Vessel and towed equipment.

The Seismic Vessel will be accompanied by at least one support vessel when safe to do so. The survey vessels will proactively and collaboratively manage operational information between the survey vessels and commercial fishers in the OA. The Otway Basin 3D MC MSS will adhere to the requirements of the COLREGS and Chapter 5 of the of Safety of Life at Sea (**SOLAS**), as implemented in Commonwealth waters through the Navigation Act 2012 and associated Marine Orders.

In the event that impacts to commercial fishing operations cannot be avoided, all evidence-based compensation claims made by commercial fishing licence holders for reduced catch or other costs incurred due to displacement by the Otway Basin 3D MC MSS, or for equipment damage/loss will be assessed for merit in accordance with the TGS Commercial Fisheries Compensation Protocol (see **Section 7.2.3.1 and Appendix N**) which has been developed in accordance with the National Energy Resources Australia Collaborative Seismic Environment Plan Project – Commercial Fishing Industry Adjustment Protocol.

The OA and AA for the Otway Basin 3D MC MSS were defined taking into consideration commercial fishing activities within the Otway Basin. With the exception of the 2D tie line AA (water depth 115 m, **Figure 4**), the AA is located in water depths greater than 510 m and avoids areas of high fishing effort by many commercial fisheries (see **Figure 48** to **Figure 66**). There are several Commonwealth and State managed commercial fisheries that have historically had catch effort with the OA (see **Section 4.7.3**). A brief assessment has been undertaken within **Sections 7.1.3.1.1** to **7.1.3.1.4** for those fisheries that have reported overlap with the OA.

7.1.3.1.1 Commonwealth Fisheries

7.1.3.1.1.1 Commonwealth Trawl Sector

The CTS has been identified as one of the main fisheries with a potential for interaction with the Otway Basin 3D MC MSS.

The CTS operates year-round and will therefore have a temporal overlap with the Otway Basin 3D MC MSS. However, ABARES fishing effort data for 2016 – 2020 indicates that fishing effort is primarily concentrated along the edge of the outer continental shelf and upper slope, typically in waters shallower than 700 m or 1,000 m depending on closure areas in the western zone of the fishery. Areas of low to high relative intensity overlap with the northern and eastern boundaries of the OA and AA in waters offshore of the South Australia/VIC border and off western TAS (**Figure 48**). The CTS will therefore only be disrupted if a survey phase involves seismic acquisition and vessel movements in water depths less than 1,000 m.

Trawlers within the CTS used a mobile method of fishing, and although their method of fishing has no fishing gear deployed and left on the seabed for any period of time, they may experience some displacement from the OA. However, this will be temporary in nature, with fishing being able to re-commence following the passage of the Seismic Vessel and towed equipment. Fishing effort will also be able to continue within the OA in areas outside of the influence of the Seismic Vessel and towed equipment.

7.1.3.1.1.2 Scalefish Hook Sector

The SHS targets similar stocks as the CTS. ABARES fishing effort data for 2016 – 2020 indicated that fishing effort is generally reported as <5 vessels per 60 NM reporting block, with only a few areas of fishing intensity mapped off southern and eastern TAS (**Figure 49**). As a result, there is potential for interactions between the SHS and the Otway Basin 3D MC MSS, however, this interaction will be limited to relatively low numbers of vessels.

7.1.3.1.1.3 Gillnet, Hook and Trap Sector – Shark Gillnet Sub-Sector

Fishing effort in the GHTS Shark Gillnet Sub-Sector occurs in continental shelf waters off VIC, TAS, and South Australia. Most vessels appear to fish in the central Bass Strait and in waters off Southern Australia, as evidenced by mapped areas of low – high fishing intensity for 2016 – 2020 (**Figure 50**). The areas of low – high fishing intensity lies outside the boundaries of the OA, with fishing effort within the OA limited to relatively few vessels (<5 vessels per 60 NM block).

7.1.3.1.1.4 Gillnet, Hook and Trap Sector - – Shark Hook Sub-Sector

Fishing effort within the GHTS Shark Hook Sub-Sector occurs in continental shelf waters off VIC, TAS, and South Australia, with most vessels fishing in waters off South Australia and north-east TAS, where areas of low – high fishing intensity have been mapped by ABARES for 2016 – 2020. These areas of low – high fishing intensity are largely outside of the OA, with fishing effort within the OA limited to relatively few vessels (<5 vessels per 60 NM block per year) (**Figure 51**). There is potential for interactions between the GHTS Shark Hook Sub-Sector and the Otway Basin 3D MC MSS; however, this interaction will be limited to relatively low numbers of vessels.

7.1.3.1.1.5 Southern Squid Jig Fishery

Fishing effort within the SSJF is highly variable due to the fluctuating market value of the target species, Gould's squid. The OA primarily overlaps with 60 NM blocks reported as having <5 vessels per year, although an area of low – high intensity was identified on the outer continental shelf off Portland, VIC, along the northern boundary of the OA (**Figure 53**).

The potential for interaction with this fishery is dependent on whether it is actively targeting squid at the time of the Otway Basin 3D MC MSS. The SSJF will only be disrupted if a survey phase involves seismic acquisition and vessel movements in water depths less than 1,000 m during an active period of the fishery.

7.1.3.1.1.6 Southern Bluefin Tuna Fishery

The potential for interaction with the SBT purse seine fishery depends on the location of fishing activities in any given season, however, in the period between 2016 and 2020, there has been no overlap in fishing effort within the purse seine fishery and the OA (**Figure 55**), with effort becoming increasingly focused in the eastern part of the fishery in waters off South Australia.

Although fishing effort within the SBT long-line fishery is mainly concentrated off the coast of NSW, low levels of fishing intensity has occurred off the coast of VIC in waters that overlap with the OA. This fishing effort has been limited to <5 vessels per 60 NM block for the period 2016 – 2020 (**Figure 56**).

Interaction with this fishery is potentially complex given that juvenile SBT caught in purse seine nets are then transferred to tow cages and towed at low speeds to Port Lincoln, South Australia. As a result, interactions with the SBTF could include both fishing and tow vessels.

During engagement with relevant persons (**Section 5**), Tuna Australia advised that as quota for SBT increases, the long-lining fishery sub-fishery of the SBTF (associated with long liners in the ETBF) may expand in the coming years form the east coast to include a greater level of fishing and searching for new fishing grounds off TAS and VIC. The quota fished for the long ling sub-fishery occurs after the quota by the purse-seine fishery has been caught or the season ended, therefore long-liners tend to fish between April and December. Long liners may also access deeper offshore waters than the purse seine sub-fishery. Given limited previous effort by long liners in the OA, the potential extent and magnitude of interactions is difficult to predict until such shifts in the fishery occur. Generally, it is considered that a survey phase could limit the ability of long liners to access new fishing grounds in the area.

TGS has been engaging with ASBTIA (and other representatives for the SBTF) throughout the preparation of this EP. As part of the engagement process with ASBTIA, TGS developed a Southern Bluefin Tuna Assessment Area across the OA towards South Australian waters. The intention of this Assessment Area is to manage the potential risk to both SBT behaviour during SBTF fishing and towing operations, and to divers involved in the fishing operations. When operating within Assessment Area, TGS proposed to:

- Notify ASBTIA of the proposed survey activities at least 4 weeks prior to commencement;
- Conduct a joint risk assessment with ASBTIA and share vessel contact details prior to commencing acquisition;
- During acquisition, maintain direct communication between the seismic vessel and SBT fishing and tow vessels;
- Based on reported experience of SBT fishing and tow vessels as the seismic vessel approaches areas of SBT fishing or towing activities, stand-off and adaptive management measures, as agreed to in the joint risk assessment, will be implemented; and
- MFOs on board the survey vessels will record the locations of any SBT at the surface and will communicate these to SBT fishing and tow vessels and to ASBTIA.

The approach was intended to find an amicable approach to managing simultaneous operations that allows both industries to conduct their operations while the seismic vessel approaches. Management would be adaptive on-the-water observations at the time. However, following subsequent feedback from both the tuna industry and other relevant persons, the OA was reduced and no longer covers the South Australian waters that were covered under the Southern Bluefin Tuna Assessment Area. Several of the proposed measures to be adopted within the Assessment Area are routine control measures that will be adopted throughout the OA and therefore will remain for the Otway Basin 3D MC MSS. For example, all survey vessels will be in radio contact at all times with other marine users, and all relevant persons will be given notification of the Otway Basin 3D MC MSS four-weeks prior to the commencement of the survey. Furthermore, TGS will provide any sightings of tuna aggregations to ASBTIA made from the survey vessels or during periodic aerial surveys.

Given the potential complexity of interactions with the SBTF and high value of the catch, it is recognised that some uncertainty remains regarding potential interactions with expanding long line operations. However, given that a survey phase will occupy discrete area and SBT are highly mobile throughout the region, alternative areas will be accessible outside of the survey phase.

7.1.3.1.1.7 Eastern Tuna and Billfish Fishery

The northern part of the OA overlaps with blocks were <5 vessels per year are reported to have fished during the period 2016 – 2020 (**Figure 54**). To date, fishing has not occurred here every year during this period. Based on infrequent, and low historical fishing effort, the potential for interaction is limited, however, fishing effort could increase in this region in association with the SBTF, as assessed in **Section 7.1.3.1.1.6.**

7.1.3.1.2 Victoria Fisheries

7.1.3.1.2.1 Rock Lobster Fishery

Fishing effort within the VIC Rock Lobster Fishery primarily occurs on the continental shelf and is greatest in water depths less than 100 m. A relatively low level of fishing effort has occurred along the northern boundary of the OA in the period 2016 – 2020, with all blocks overlapping the AA experiencing 1 – 30 fishing days across this period (**Figure 58**). Water depths within the AA range between approximately 100 m and 1,000 m. It is understood from consultation with rock lobster industry representatives that fishing in the deep waters happened occasionally when targeting 'white fish' to bulk up an order for a large amount of lobster meat.

Overall, the OA and AA avoids the most target areas within the Rock Lobster Fishery, with only a low effort of fishing activity in deeper waters of the OA and AA when targeting white fish. Acquisition of the 2D tie line will extend into shelf waters (minimum depth 114 m), although this tie line represents less than a day of survey effort and any disruption will be minimal.

7.1.3.1.2.2 Giant Crab Fishery

Fishing effort within the VIC Giant Crab fishery overlaps along the northeast of the OA and AA, with greatest fishing effort occurring in five blocks overlapping water depths less than 1,000 m (**Figure 59**). The precise location of fishing effort within the blocks cannot be confirmed, but according to VFA, giant crabs mainly occur at approximately 200 m depth. The majority of the OA and AA occur in deeper waters.

Interaction with fishing vessels and pots will only occur if a survey phase involves sail lines up to the edge of the AA at a time when fishing effort is targeting deeper waters that the core range of giant crab. TGS will adopt a Giant Crab Exclusion Zone (see **Section 7.1.3.1.3.2**) over water depths shallower than 1,000 m to the south of the 2D tie line extension. While this is primarily to protect giant crab fishing effort in the TAS Giant Crab Fishery, it also reduces overlap with giant crab habitat and fishing grounds in the VIC Giant Crab Fishery.

7.1.3.1.2.3 Ocean Fish General Fishery

A single fishing block for the VIC Ocean Fish General Fishery overlaps the northern boundary of the OA and AA (**Figure 60**). This represents a single day reported by one fisher in 2020, therefore interaction with fishing vessels in this fishery is highly unlikely.

7.1.3.1.3 Tasmanian Fisheries

7.1.3.1.3.1 Rock Lobster Fishery

Fishing within the TAS Rock Lobster Fishery is greatest in the waters surrounding King Island, with the OA overlapping slightly with an area fished by 51 – 75 vessels per year (**Figure 61**). In all other blocks overlapping the OA and AA, fishing effort is <5 vessels per year. Fishing effort is expected to be concentrated inshore of the OA, with some limited effort in deeper waters along the OA boundary.

TGS will implement a Giant Crab Acoustic Exclusion Zone to protect the TAS Giant Crab Fishery. This will also serve to protect the TAS Rock Lobster Fishery.

7.1.3.1.3.2 Giant Crab Fishery

Fishing effort within the TAS Giant Crab Fishery primarily takes place in water depths less than 400 m, however, the OA and AA overlap with an area of high fishing effort to the south-east of King Island (**Figure 62**).

TAS Giant Crab representatives engaged with during the preparation of this EP state that fishing for giant crab sometimes occurs at depths greater than 400 m. Following feedback during the relevant persons engagement process, in order to protect giant crab within deeper habitats within the OA and AA, TGS will implement a Giant Crab Acoustic Exclusion Area (**Figure 74**), within which there will be no activation of the acoustic source. This area covers the waters along the eastern boundary of the OA and AA that are 1,000 m or less. With the implementation of the Giant Crab Acoustic Exclusion Area, interaction with vessels and pots associated with the TAS Giant Crab Fishery is expected to be avoided.

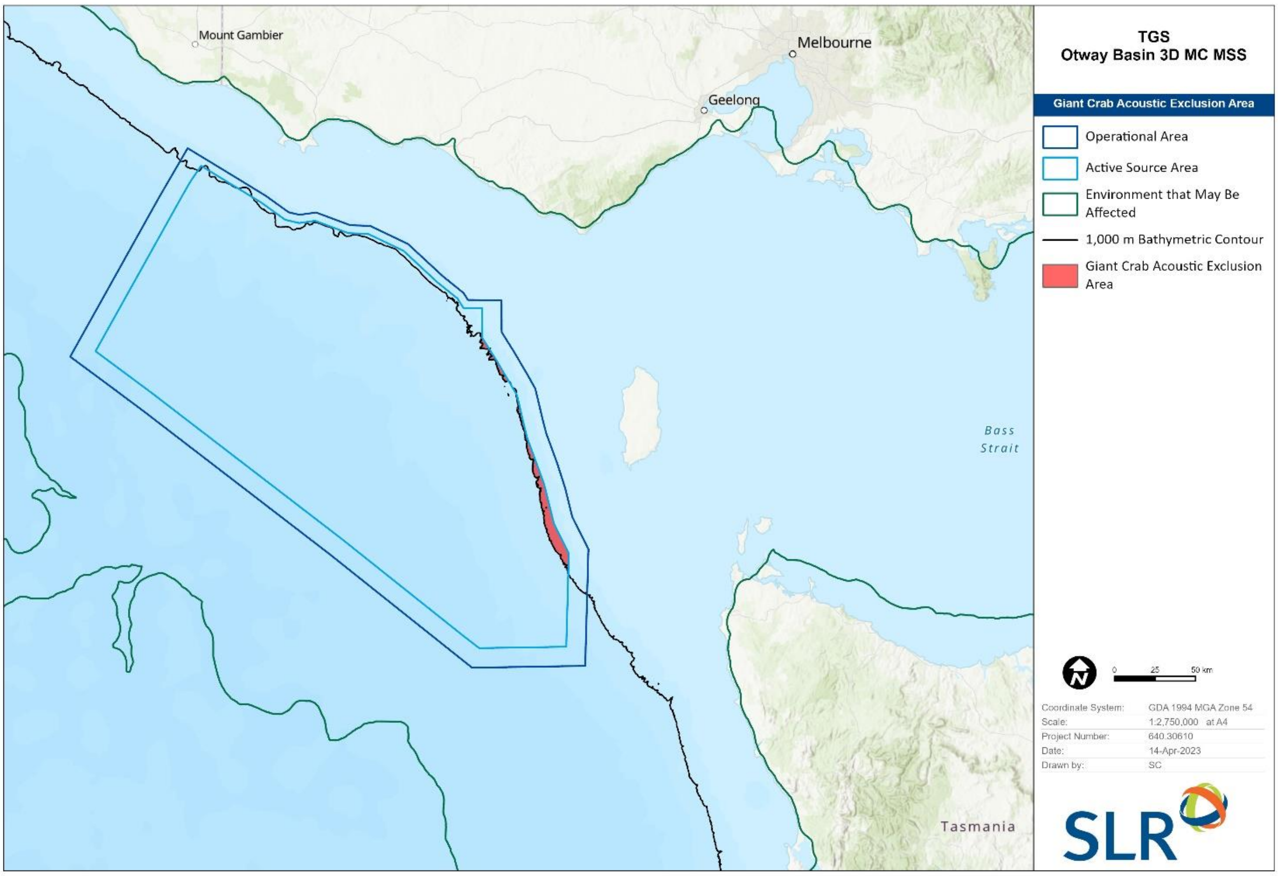


Figure 74 Giant Crab Acoustic Exclusion Area

7.1.3.1.3.3 Scalefish Fishery

Fishing effort within the TAS Scalefish Fishery focuses on the waters surrounding King Island. All blocks that overlap the AA were fished by >5 vessels per year for the period 2016 – 2020. The OA overlaps with one block that was fished by 5 – 10 vessels per year for the period 2016 – 2020 (**Figure 63**). The implementation of the Giant Crab Acoustic Exclusion Zone to protect the TAS Giant Crab Fishery is expected to also ensure interactions with vessels in the TAS Scalefish Fishery are avoided.

7.1.3.1.4 South Australian Fisheries

7.1.3.1.4.1 Rock Lobster Fishery

Fishing effort within the South Australian Rock Lobster Fishery primarily occurs in water depths up to 200 m. Although the OA and AA overlap with a fishing block with a high reported fishing effort (**Figure 64**), the precise location of fishing effort cannot be confirmed and it is likely that the deeper waters of the OA and AA are outside the main habitat for rock lobster and interactions with rock lobster vessels and pots are not expected.

7.1.3.1.4.2 Marine Scalefish

The South Australian Marine Scalefish Fishery primarily targets continental shelf species, and although the OA and AA overlap with a fishing block reported to have had a relatively high level of fishing effort in the period 2016 – 2020 (**Figure 66**), it is likely that the deeper waters of the OA and AA are outside the main areas targeted by this fishery.

7.1.3.1.5 Summary of Potential Impacts to Commercial Fisheries

Except for the 2D tie line AA (water depth 115 m, **Figure 4**), the AA covers water depths greater than 510 m and avoids areas of high fishing effort by many commercial fisheries. However, the northern and eastern boundaries of the AA and the OA still overlap with some fished areas on the upper continental slope and outer shelf.

The Otway Basin 3D MC MSS is a multi-client MSS and, as such, will acquire seismic data over discrete areas depending on petroleum titleholder interest over the full duration of the EP (see **Section 3.3**). Therefore, individual phases of the Otway Basin 3D MC MSS will target smaller and more discrete areas than the entire AA as the Seismic Vessel will only be operating in part of a 'Phase Operational Area' at any one time. Given that the exact location of individual phases cannot be defined at this stage, the assessment provided within this EP considers the potential extent of interference with each fishery as a worst case, noting that the extent may be significantly less.

The two fisheries with the greatest potential for interaction with the Seismic Vessel and towed equipment are the CTS and the SBTF (purse seine fishery and long line fishery).

Given the potential complexity of interactions with the SBTF and high catch value, some uncertainty remains regarding potential interactions with expanding long lining operations, however, given that a survey phase will occupy a discrete area and SBT are highly mobile throughout the region, alternative areas will be accessible outside of the survey phase area. Furthermore, the OA of the Otway Basin 3D MC MSS has been reduced, with the south-western boundary pulled back towards VIC waters and away from South Australian waters where the highest concentration of fishing within the SBTF occurs.

State managed giant crab fisheries typically target giant crab in water depths less than 400 m, but some fishing effort in deeper waters may occur. The 3D AA (generally deeper than 600 m) avoids the main area of fishing effort, although interactions with fishing in deeper waters may occur infrequently. A Giant Crab Acoustic Exclusion Area has been applied to water depths less than 1,000 m south of the 2D tie line AA which will ensure that interactions with vessels and pots in the TAS and VIC Giant Crab Fisheries are avoided. Acquisition of the 2D tie line has the potential for interactions with the VIC Giant Crab Fishery, although this tie line represents less than a day of survey effort and any interactions will be minimal. The Giant Crab Acoustic Exclusion Area also acts to minimise the potential for interactions with other fisheries (e.g. South Australian and VIC rock lobster fishers).

Fishing effort by other commercial fisheries is generally infrequent and of a low level such that movement of the Seismic Vessel and towed equipment along the most northerly and easterly margins of the OA are unlikely to result in a significant displacement of commercial fishers.

In the event that impacts to commercial fishing operations cannot be avoided, all evidence-based compensation claims made by commercial fishing licence holders for reduced catch or other costs incurred due to displacement by the Otway Basin 3D MC MSS, or for equipment damage/loss will be assessed for merit in accordance with the TGS Commercial Fisheries Compensation Protocol (see **Section 7.2.3.1** and **Appendix N**) which has been developed in accordance with the National Energy Resources Australia Collaborative Seismic Environment Plan Project – Commercial Fishing Industry Adjustment Protocol.

The Support Vessel/s will try to contact any vessel it sees in the exclusion area (i.e. the area identified within the 48-hour look ahead plans taking into consideration the vessel requested exclusion zone), and if there are traps remaining on the seabed (marked by surface buoys), the Support Vessel/s would try to contact the fishers whose gear is still in the water in the first instance to warn of the oncoming Seismic Vessel. In addition, to reduce the potential spatial overlap of fishing and data acquisition effort, TGS will provide any potentially affected commercial fishers with 48-hour look-ahead plans of where the survey vessels will be operating to enable them to incorporate the survey route into their fishing plans. This look-ahead will be updated and distributed every 24 hours. It is however, acknowledged that due to unforeseen circumstances, changes to where the Seismic Vessel may be required to traverse to acquire data may occur with limited notice to mariners making it difficult for commercial fishing operations to tightly coordinate fishing activities with planned vessel movements.

TGS acknowledges that consistent and timely communication on the location and timing of data acquisition activities is required to facilitate appropriate planning and to maximise the chance to share available spatial resources. Australian fishing licence holders that actively fish in the OA have been identified through the relevant persons consultation process and continual communications and notification (e.g. 48-hour look-ahead plans) will take place with these licence holders and their respective associations to ensure they are aware of where the vessel will be throughout the duration of the Otway Basin 3D MC MSS. Likewise, all methods of communication will be made available to the licence holders to contact the survey vessels should they need to be in contact with TGS or the survey vessels at any time.

Following consultation with commercial fisheries representatives, TGS will implement a fisheries compensation protocol to manage potential impacts from the Otway Basin 3D MC MSS including due to the presence of survey vessels and towed equipment on the commercial fishing industry in Australian waters. Further details of the proposed compensation protocol are provided in **Section 7.2.3** and **Appendix N**.

Any effects to commercial fisheries from the physical presence of the survey vessels and towed equipment are expected to be localised and only short-term disruptions to normal activities are expected. It is considered likely that the presence of the survey vessels and towed equipment will result in changes to commercial fishing operations to occur; however, with the implementation of the Commercial Fisheries Compensation Protocol, any claims of compensation due to changes will be assessed and compensation provided if required.

The physical presence of the Seismic Vessel and towed equipment are not predicted to impact key indicator commercial fish populations, thereby having negligible effect on the overall sustainability status of the fishery. As such, the residual risk to commercial fisheries due to the presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Likely*).

7.1.3.2 Potential Impacts and Risks to Commercial Shipping

Frequent vessel traffic is expected to be encountered within the OA due to vessels heading in and out of Adelaide, Portland, Melbourne and Hobart, and vessels traversing the east-west/west-east shipping routes (**Section 4.7.4**).

Twenty-four-hour radar and visual watch and open radio communications between vessels will occur during the Otway Basin 3D MC MSS. Early communication allows for the speed and course of vessels to be ascertained in a timely manner and any necessary adjustment of course to be confirmed.

Some commercial vessels may need to deviate from their intended routes to avoid the Seismic Vessel and towed array. Vessel encounters that occur in line with the Seismic Vessel will involve a minor deviation of course to give way to the vessel, which would likely be similar to the deviation given to any other vessel transiting the region. Vessels that are sailing crossways to the survey sail line will need to deviate a greater distance. As the OA is in open waters with no grounding or navigational hazards, it is not likely that any such deviations would increase the potential for vessel collision or grounding in the area.

Commercial vessel masters are familiar with procedures for operating in the vicinity of a vessel restricted in its ability to manoeuvre and the survey vessels' masters and crews operate in areas of the world with significantly higher vessel traffic without significant issue. Therefore, no significant navigational implications or long-term changes in shipping traffic patterns are expected.

There is the potential that the Otway Basin 3D MC MSS could displace commercial vessels transiting through the OA causing them to alter their planned course. However, given the Seismic Vessel will be continually moving the actual zone of displacement that would influence commercial shipping will be transitory in nature. Therefore, the risk to commercial shipping operations due to the physical presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Likely*).

7.1.3.3 Potential Impacts and Risks to Tourism and Recreation

The coastal marine area inshore of the OA and EMBA provide opportunities for marine tourism and recreational activities such as boating, diving, surfing, and fishing. Given the water depths within the OA (97 – 5,000 m), distance from shore (31 km to the closest point on the mainland), and exposed and changeable sea and weather conditions, the OA does not provide many opportunities for tourism and recreation activities. Despite these limitations, there is still potential for activities associated with the Otway Basin 3D MC MSS to displace other marine users from their preferred areas of activity, in particular recreational fishers and boating.

Recreational boating activities peak during the summer months, and this increase in activity is likely to occur inshore of the OA. Recreational boaters and tourism operators tend to utilise the waters surrounding major ports and settlements, such as the sheltered waters of Port Phillip Bay (VIC) and the relatively inshore waters of the Spencer Gulf and Gulf of St Vincent (South Australia). The Otway Basin 3D MC MSS is proposed to occur between October and March (**Section 3.3**) so it is likely there will be a large number of recreational and tourism boats out on the water; however, most of these boats are likely to be well inshore of the Otway Basin 3D MC MSS OA.

The scheduling of the Otway basin 3D MC MSS overlaps with the recreational open seasons for diving for abalone and rock lobster, and fishing for squid, striped trumpeter, prawns, and banded morwong. The presence of the Seismic Vessel will not displace recreational divers from their dive site or from fishing areas due to the considerable distance offshore of the OA.

The Melbourne to Hobart (Westcoaster) yacht race follows the west coast of TAS and has the potential to overlap (both temporally and spatially) with the Otway Basin 3DMC MSS. The race occurs over two days in late December. Races run by the Ocean Racing Club of VIC at Christmas also utilise the west and south coasts of TAS and may overlap (both temporally and spatially) with the Otway Basin 3DMC MSS. TGS has undertaken consultation with Ocean Racing Club of VIC to appropriately manage any overlap between the Otway Basin 3D MC MSS and yacht racers to ensure there is no risk of overlap between Survey Vessels and competitors or increased risk of a collision.

To manage any potential risk to tourism and recreational users of the OA, TGS has consulted with key industry representative bodies, will issue maritime warnings and a Notice to Mariners effective for the duration of the Otway Basin 3D MC MSS, and maintain standard maritime radio communications.

The intermittent and transitory nature of the Seismic Vessel operating within the OA is thought to present minimal displacement or inconvenience to tourism and recreation in the area. Therefore, the residual risk to tourism and recreation due to the physical presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible x Unlikely*).

7.1.3.4 Potential Impacts and Risks to Petroleum Exploration and Production Operations

The Otway Basin is an established hydrocarbon province in Australia, with several commercial operations within the area (**Section 4.7.5**). Vessels associated with nearby petroleum operations may be asked to deviate from intended routes to avoid the Seismic Vessel and towed equipment. However, this is unlikely on account of all currently operating oil and gas facilities (for example, the Thylacine platform) occurring inshore of the OA (see **Figure 68**).

Although it is not anticipated that the survey vessels will need to transit near any petroleum exploration and production operations, all vessels will adhere to the prohibition of vessel entry into designated petroleum safety zones and surrounding petroleum wells, structures, or equipment.

TGS will work collaboratively with petroleum operators to ensure interactions offshore are minimised and has consulted with petroleum holders throughout the development of this EP, with consultation continuing for the life of this EP. Should the Otway Basin 3D MC MSS be undertaken during operations which overlap with oil and gas operations (e.g. commercial diving operations on underwater infrastructure), a SIMOPS plan will be developed in close collaboration with the relevant persons.

The intermittent and transitory nature of the Seismic Survey Vessel operating within the OA is thought to present minimal displacement or inconvenience to petroleum exploration and production operations in the area. Therefore, the residual risk to petroleum and production operations due to the physical presence of the survey vessels and towed equipment during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.1.4 Decision Context

The decision context for physical presence of the Seismic Vessel and towed equipment has been assessed as Type A for most receptors, given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons. However, given the level of interest raised by relevant persons regarding predicted impacts to commercial fisheries, the decision context for this receptor has been characterised as Type B.

7.1.5 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

Control/mitigation measures that will be implemented during the Otway Basin 3D MC MSS to manage the impacts associated with the physical presence of the Seismic Vessel and towed acoustic equipment to **ALARP** have been listed in **Table 57**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction (**Table 57**), based on a Hierarchy of Controls methodology (**Table 56**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 56 Hierarchy of Control Measures for Physical Presence of the Seismic Vessel and Towed Equipment

Eliminate	Alternative data acquisition methods are not yet commercially available or proven to meet geophysical data quality objectives, operational safety, and reliability requirements. The Seismic Vessel and towed equipment are, therefore, required for data acquisition and cannot be eliminated. The presence of a Support Vessel/s is a health and safety requirement which acts to reduce the risk of collision between the Seismic Vessel/towed equipment and other marine users and/or entanglement between marine fauna/fishing gear and seismic equipment.
Substitute	Alternative data acquisition methods are not yet commercially available or proven to meet geophysical data quality objectives, operational safety, and reliability requirements. The Seismic Vessel and towed equipment have been designed to meet the survey objectives and guarantee data quality. Due to the transient nature of the survey, the cost of substituting the equipment (e.g. to adopt the use of shorter streamers) are considered disproportionate to the limited (if any) environmental benefits gained.
Reduce	The impact from the physical presence of the Seismic Vessel and towed equipment will be reduced by the implementation of the control measures described within **Table 57.** Streamers will be marked with tail buoys to notify other marine users of the presence of the towed equipment and reduce the risk of collision.
Mitigate	To mitigate the impacts from the physical presence of the Seismic Vessel and towed equipment, a compensation protocol will be implemented to formally manage claims by commercial fishers for loss of catch, displacement, and/or lost or damaged fishing gear as a consequence of the Otway Basin 3D MC MSS (**Section 7.2.3.1**).

Table 57 Assessment of Control Measures for the Physical Presence of Seismic Vessel and Towed Equipment

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of routine permissible waste discharges.	Yes
All survey vessels will adhere to the requirements of the national and international legislation, including COLREGS and Chapter 5 of SOLAS as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21, 28, 30, 58 and the STCW Convention. The requirements give effect, but are not limited to, the following: • Appropriate use of lighting, navigation and radio communication at sea; and • 24-hour bridge and radar watch by qualified watch-keepers to monitor for other marine users.	P = Yes E = Effective	The survey vessels must adhere to the Navigation Act 2012 and associated Marine Orders. Procedures under the Navigation Act 2012 are standard and well-understood among commercial vessels. The survey vessels will use standard international safety procedures for radio communication and the display of navigational lights and day shapes including the use of Automatic Radar Plotting Aids (**ARPA**) and AIS. AIS sends and receives ship information including identity, position, course, and speed, and updates as often as every two seconds. The Seismic Vessel will display day shapes and lights to indicate that the vessel is towing equipment and is restricted in its ability to manoeuvre. Tail buoys will be fitted with a light and radar reflector indicating the end of each streamer. The survey vessels will use standard international safety procedures for radio to ensure survey vessels will be contactable by radio at all times (i.e. VHF and SSB radio). The Otway Basin 3D MC MSS will adopt standard flag and class practices for watch-keeping and radio use to ensure that warnings and preventative actions can be readily implemented. This will notify other marine users of the presence of the Seismic Vessel and equipment. Watch-keepers will have the relevant qualifications for the task. This practise is compliant with STCW Convention. It is a legislative requirement for vessels to comply with the Navigation Act 2021 as well as good industry practice.	Yes
Adherence to the prohibition of entry into established Petroleum Safety Zones surrounding petroleum wells, structures, or equipment.	P = Yes E= Effective	Oil and gas installations and equipment have established Petroleum Safety Zones (**PSZ**) prohibiting any vessel approaching closer than 500 m without prior approval/provision of a permit. These are established under the OPGGS Act. A review of the gazetted notices for Petroleum or Greenhouse Gas Safety Zones published on NOPSEMA's website indicate the OA does not encroach into any PSZ. It is a legislative requirement.	Yes
Vessel masters' of the Support Vessel/s will comply, when safe to do so, with the relevant requirements of EPBC Regulations 2000 Part 8, Division 8.1, including: • Taking action to avoid approaching or drifting closer than 50 m to an adult dolphin or 100 m to an adult whale; • Taking action to avoid approaching or drifting closer than 150 m to a dolphin calf or 300 m to a whale calf; • Making all efforts not to let a calf enter the caution zone; and • Not exceeding a speed of six knots within the caution zone of a cetacean (300 m).	P = Yes E = Effective	The requirements of the EPBC Regulations set out clear measures to reduce speed and avoid approaching cetaceans, which reduces the risk of collision or entanglement. The support vessels will comply with the EPBC Regulations 2000 Part 8, Division 8.1 in order to reduce the risk of disturbing cetaceans (adult and calf) and avoiding collisions between a cetacean and the support vessels. For safety reasons, the distance requirements are not applied to vessels with limited manoeuvrability, such as the Seismic Vessel It is a legislative requirement for vessels to comply with the EPBC Act and EPBC Regulations.	Yes
Any vessel strike incident to marine mammals will be reported as soon as practicable via the National Vessel Strike Database within 72 hours of the incident.	P = Yes E= Effective	Reporting ship strikes with cetaceans is requested by the DAWE's Australian Antarctic Division and allows the Australian Government and International Whaling Commission (**IWC**) to compile scientific data on vessel strike incidents, locations and trends so that further management can be considered. Good industry practice, environmental benefit outweighs additional cost.	Yes

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Good Industry Practice:			
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	P = Yes E =Effective	A communications protocol will be in place which details the methods used to contact third-party vessels prior to commencement of the Seismic Survey, throughout the survey duration, and following completion of the survey, and those identified only once at sea, to actively manage concurrent activities. Communication with relevant persons allows those potentially affected by the Otway Basin 3D MC MSS to plan activities in a manner that reduces the risk of interactions with the survey vessels and towed equipment (e.g. commercial fishers can avoid deploying gear in the path of the Seismic Vessel). TGS will provide a daily 'look-ahead' plan, which details the proposed operations for the next 48-hour period. Information regarding proposed operations will include, as a minimum, the current positions of the survey vessels and the proposed timing and location of operations for the following 48 hour period. These will be provided daily to those relevant persons who register for the service. Good industry practice, safety benefit outweighs additional cost.	Yes
Notification to the Australian Hydrographic Office (**AHO**) for the publication of a Notice to Mariners of survey presence and towed array, no less than four weeks before operations commence.	P = Yes E = Effective	Under the Navigation Act 2012, AHO can publish and distribute a Notice to Mariners. This Notice outlines potential hazards and restrictions to relevant persons. AHO will be contacted four weeks prior to the commencement of the survey for the publication of related Notices to Mariners. Good industry practice, safety and socio-economic benefit outweighs additional cost.	Yes
Notification to the Joint Rescue Coordination Centre (**JRCC**) for the promulgation of navigational warnings (i.e AUSCOAST warnings)	P = Yes E = Effective	The JRCC will be contacted 24 – 48 hours before operations commence for issuing of radio-navigation warnings. This will ensure that commercial fishers are aware of the Otway Basin 3D MC MSS. Implementation will reduce the likelihood of interactions with commercial fishing vessels. Good industry practice, safety benefit outweighs additional cost.	Yes
At least one Support Vessel will accompany the Seismic Vessel when in operation and when safe to do so (e.g. outside of inclement weather periods), to manage interactions with other marine users.	P = Yes E = Effective	At least one support vessel will be present around the Seismic Vessel to intercept other vessels in the area that are at risk of interacting with the Seismic Vessel and/or equipment and to ensure other marine users in the area are provided with advanced notice of the Otway Basin 3D MC MSS. This is a health and safety requirement and is standard practice for all MSSs. Good industry practice, safety benefit outweighs additional cost.	Yes

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Compensation to fishers and vessel crews (i.e., the claimant) is demonstrated to have occurred for the following circumstances: • Interaction resulting in loss or damage to fishing equipment; • A temporary loss of fish landed catch due to damaged or lost fishing equipment; • Where displacement from fishing grounds results in additional costs incurred due to relocating; or • A temporary reduction in fish landed catch due to the effects of acoustic emissions or displacement from fishing grounds. Claims received from fishers in any circumstances other than those outlined above will not be assessed. Claims will be considered provided the interaction/displacement/loss of catch took place in the Adjustment Area (plus any additional area of avoidance requested around the survey vessels and towed equipment) where the Otway Basin 3D MC MSS took place, and within the project active time frame only.	P = Yes E = Effective	Where impacts of the Otway Basin 3D MC MSS to the commercial fishing industry in Australian waters cannot be avoided or minimised, and commercial fishers experience an economic loss as a result of the Otway Basin 3D MC MSS, financial compensation will be considered as a potential appropriate response to eligible fishery licence holders. Compensation to commercial fishers for loss or damage to fishing equipment, a temporary loss of fish landed catch due to damaged or lost fishing equipment, where displacement from fishing grounds results in additional costs incurred due to relocating, or a temporary reduction in fish landed catch due to effects of acoustic emissions of displacement from fishing grounds that is proven to have occurred as a result of the Otway Basin 3D MC MSS will be considered on a case-by-case basis. Claims received from fishers in any circumstance other than these will not be assessed. Displacement from fishing grounds can be as a result of seismic operational activities and/or as a result of avoiding contaminated waters following a fuel oil spill. For TGS to accept a payment claim, fishers will need to provide suitable documented evidence and data to demonstrate their unavoidable economic loss in accordance with the Commercial Fisheries Compensation Protocol for the Otway Basin 3D MC MSS (**Section 7.2.3.1**). All fishing history and unavoidable economic losses should relate to the Adjustment Area and to the period of Otway MSS operations. The Adjustment Area is defined as an area extending 10 km around the perimeter of the OA. Any consideration of claims (for claims for temporary reduction in catch due to displacement from fishing grounds) beyond the Adjustment Area and outside the operations period will be determined with reference to available and relevant peer reviewed information on the effects of seismic surveys, as well as the impact assessment outlined in the EP as accepted by NOPSEMA. To be eligible for compensation, claimants are required to provide initial notification of their intent to submit a claim to TGS within 30 days of equipment being damaged or lost, and/or being displaced from 'usual fishing grounds' (defined as an area where fishing activity has been recorded by the commercial fishing licence holder on Government statutory fishing returns for at least two of the previous five years). For displacement claims only, licence holders or vessels are to notify TGS at the time of relocation for claims to be valid. A completed Compensation Claim Application Form must be submitted to TGS within 12 months of notifying TGS of the intention to submit a claim. In assessing the merit of the claim, consideration will be given to the circumstances giving rise to the claim, including whether the circumstances could have been reasonably avoided. Subject to a claim being lodged, TGS (at their expense) in consultation with the claimant, will engage a suitably experienced/qualified independent person/organisation as the assessor of the claim, defined as a person or organisation with proven demonstrated experience in data analysis and data auditing processes and procedures within the industry. The assessor will provide TGS with an assessment report, which, upon receiving and considering this report, TGS will provide to the claimant and offer to meet to discuss and address the claim. If a claimant disagrees with the claim assessment outcome and cannot reach agreement with TGS, they may, within 30 days, opt to request a suitably experienced and qualified independent third-party to review and determine the outcome of the claim. This appointment will be mutually agreed between TGS and the claimant. The dispute will be resolved within 60 days of dispute receipt by TGS, with the costs of engaging the independent third-party covered by TGS. Good industry practice, socio-economic benefits outweigh additional cost.	Yes

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Development and implementation of Marine Fauna Mitigation Plan. Where possible and safe to do so, marine fauna entangled within in-water equipment will be extricated and returned to sea following the procedures provided within the Marine Fauna Mitigation Plan.	P = Yes E = Effective	One of the roles of the lead MFO is to develop a Marine Fauna Mitigation Plan, to be submitted to TGS prior to the pre-mobilisation survey and audit commencing. This plan will demonstrate the following, at a minimum: • MFOs are trained, dedicated and experienced (as per the requirements listed in **Section 10.3.5**); • Responsibilities and authorities of MFOs to ensure the plan is communicated and available to those roles that are required to implement the controls; • Communications protocols for relaying marine fauna observations to the Seismic Operator, Vessel Master and vessel crew as required; • Survey Plan – describes the proposed activity including location and timing, acoustic source and streamer configuration, equipment (vessels) and key geographic locations such as BIAs and nominated exclusion zones; • Implementation Plan – details how the marine fauna mitigation controls within the EP will be implemented; and • Handling procedures for the retrieval of marine fauna entangled in towed equipment or seabirds on the vessels' deck. Good industry practice, environmental benefit outweighs additional cost.	Yes
Vessel crew will complete an environmental induction covering the requirements for vessel interactions with marine fauna.	P = Yes E = Effective	Environmental inductions will be included as part of the crew induction package, including requirements for vessel interaction managed with marine fauna, consistent with the controls described within the accepted EP. Good industry practice, environmental benefit outweighs additional cost.	Yes
Streamers will be marked with tail buoys.	P = Yes E = Effective	Under COLREGS and the Navigation Act, all possible measures need to be taken to indicate the presence of a towed object. Tail buoys will be used to mark the ends of the streamers, so that they are visible to other vessels. Markings on the tail buoys will include reflective tape, lights, and radar reflector. An AIS transponder will also be fitted to each tail buoy to allow for the detection of the end of each streamer by other marine users with AIS receiving capabilities. Good industry practice, safety benefit outweighs additional cost.	Yes
Turtle guards will be installed on streamer tail buoys or tail buoys will be of a design that does not represent an entrapment risk to marine turtles.	P = Yes E = Effective	Almost all reported turtle entrapments during MSSs are associated with the 'undercarriage' of tail buoys (Ketos Ecology, 2009). 'Turtle guards' are fitted to the front of the tail buoys and act to physically exclude turtles from the gap at the front of the tail buoy undercarriage. A tail buoy will be fitted to the end of each streamer. If the tail buoys are not of a design that does not represent an entrapment risk to marine turtles, they will be fitted with turtle guards to prevent accidental entrapment. Good industry practice, environmental benefit outweighs additional cost.	Yes
Vessels masters' of the support vessel/s will, when safe to do so, take action to avoid approaching or drifting closer than 50 m to a marine turtle or pinniped.	P = Yes E = Effective	The Australian sea lion, Australian fur seal, and the New Zealand fur seal (**Section 4.5.6.3**), as well as three species of marine turtle (**Section 4.5.5**) have been identified as potentially present within the OA. In addition to implementing the avoidance measures required for cetaceans under the EPBC Regulations 2000 Part 8, Division 8.1, TGS has considered extending avoidance measures to marine turtles and pinnipeds. For safety reasons, the distance requirements are not applied to vessels with limited manoeuvrability, such as the Seismic Vessel. Good industry practice, environmental benefit outweighs any additional cost.	Yes

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternatives/Substitutes Controls Considered:			
Use of alternative geological imaging technology that does not require towed equipment.	P = No E = Unknown Effectiveness	To further reduce the potential for entanglement, an alternative to the use of towed streamers is the use of ocean bottom receivers; however, this was considered impractical for the following reasons: • Environmentally, ocean bottom receivers placed on the seabed may reduce the risk of marine fauna becoming entangled in towed streamers, however, ocean bottom receivers can result in unnecessary seabed disturbance particularly in sensitive areas; • Operationally, this alternative would add significantly to the cost and timeframe for the survey. Ocean bottom receivers cover much less acreage per day than towed streamer methods ; • Given that there have been no reported cases of marine fauna being entangled in seismic equipment in the Otway Basin, the risk is already very low and little additional benefit would be gained. Costs would be disproportionate to the benefit that may be gained.	No
Removal of support vessels.	P = No E = Limited	Support vessels are required to avoid interactions with other marine users (i.e. other vessels) as a health and safety requirement as well as implementing the control measures. Increased risks associated with the removal of the support vessels are disproportionately higher than the benefit of removing a vessel.	No
Reduction in the length of the towed equipment.	P = No E = Limited	The length of the streamers planned to be used for the Otway Basin 3D MC MSS is 8 – 10 km. Streamer length has been designed to meet the survey objectives and guarantee data quality. Reducing the length of the towed equipment, or substituting with shorter streamers, will reduce the footprint of the Otway Basin 3D MC MSS; however, as the vessel and towed equipment are continuously moving, the benefit to other marine users would be minimal and costs would be disproportionate to any benefit gained.	No
Additional Control Measures Considered			
Towed equipment will be retrieved when the Seismic Vessel is in transit to and from the OA (e.g. to and from port).	P = No E =Effective	Retrieval of towed equipment would reduce the potential for more coastal species interacting with the towed equipment whilst in transit and will minimise the spatial footprint of the Seismic Vessel when transiting; however, the Seismic Vessel may on occasion be required to exit the OA without retrieving the towed equipment, such as during periods of inclement weather. Not practicable to implement.	No
The acoustic source will only be deployed and retrieved within the bounds of the OA.	P = Yes E = Effective	As outlined above, there may be occasions during the Otway Basin 3D MC MSS whereby the vessel may be required to exit the OA while towed equipment remains deployed. In order to ensure there is no accidental discharge of the acoustic source outside of the boundaries of the OA, the acoustic source will only be deployed and retrieved in the OA.	Yes
Retrieval of any equipment accidentally lost at sea, including streamers, where it is safe and practicable to do so to ensure it does not become a risk to other marine users. Pressure activated streamer recovery devices will be fitted along the streamers.	P = Yes E =Effective	Any in-water equipment that is lost will be recovered when it is safe and practicable to do so. Pressure activated streamer recovery devices will be fitted along the streamers. Where equipment cannot be safely or practicably retrieved, the incident will be reported to AMSA and AHO as soon as the loss/incident is identified. Good industry practice, safety and environmental benefit outweighs additional cost.	Yes
Access to Seismic Vessel tracking information via Google Earth for fisheries relevant persons who have registered for the service.	P = Yes E =Effective	TGS will provide commercial fishers with access to Seismic Vessel tracking information via Google Earth. This will ensure that commercial fishers are aware of the exact location of the Seismic Vessel in real time. Implementation of this control measure will reduce the likelihood of interactions with commercial fishers.	Yes

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Giant Crab Acoustic Exclusion Area within waters 1,000 m or less south of the 2D tie line AA.	P = Yes E = Effective	TGS will adopt an Acoustic Exclusion Area over water depths shallower than 1,000 m to the south of the 2D Tie Line AA. This protects giant crab habitat but also areas where giant crab fishing effort in the TAS Giant Crab Fishery may occur. The control also indirectly reduces overlap with giant crab habitat and fishing grounds in the VIC Giant Crab Fishery.	Yes
Manage impacts to the SBTF through the implementation of a SBT Assessment Area for waters offshore from South Australia, and a joint risk assessment with the SBTF.	P = Yes E = Effective	Following consultation with SBTF representatives (i.e. ASBTIA), in order to provide a mechanism to simultaneous operations with the SBTF, TGS designated all waters in the OA from South Australia as a SBT Assessment Area. This area was proposed to manage the potential risk to both SBT behaviour during SBT fishing and towing operations, and also to divers involved in fishing operations. When seismic acquisition is planned to occur within the SBT Assessment Area, TGS proposed to: • Notify ASBTIA of the proposed survey activities at least four weeks prior to the commencement of survey activities; • Conduct a joint risk assessment with ASBTIA and share vessel contact details prior to commencement of survey activities; • During seismic acquisition, maintain direct communication between the seismic vessel and SBT fishing and tow vessels; • As the vessel approaches areas of SBT fishing or towing activities, stand-off and implement adaptive management measures, as agreed in the joint risk assessment; and • Have MFOs record the locations of any SBT at the surface and communicate co-ordinates to SBT fishing and tow vessels and ASBITA. The above approach was intended to find an amicable approach to managing simultaneous operations that allows both industries to conduct their operations while the seismic vessel approaches; however, following subsequent consultation with relevant persons, the OA was revised and the waters offshore from South Australia that were to be designated as the SBT Assessment Area were removed. The implementation of a SBT Assessment Area is therefore no longer required, however, ASBTIA will still be notified of the proposed survey activities at least four weeks prior to commencement of the survey under the required four-week notification as per the Communications Protocol, all survey vessels will be contactable at all times by other marine users (including SBT fishers) via radio communications (as per the requirements of COLREGS and Chapter 5 of SOLAS as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21, 28, 30, 58 and the STCW Convention), and the Seismic Vessel will consider alternative lines, where practicable following receipt of information from commercial fishers (including SBT fishers) on upcoming fishing activities. MFO on the survey vessels and during aerial surveys will be instructed to remain vigilant for SBT at the surface, with observations reported to ASBTIA (see control measure below).	Partially

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Adjustment of sail lines to accommodate commercial fishers' requests.	P = No E = Limited	As discussed in **Section 4.7.3**, there is limited overlap with the Otway Basin 3D MC MSS and heavily targeted areas by commercial fishers on account of the deep water depths throughout the OA. This reduces the likelihood of there being impacts to commercial fishers from the physical presence of the Seismic Vessel and towed equipment. All survey vessels contracted for the Otway Basin 3D MC MSS will be contactable at all times throughout the duration of the survey. Survey lines have been pre-planned to allow accurate data acquisition and to ensure the survey is completed in the most economic way. The planned movements of the Seismic Vessel for the upcoming 48-hour will be provided to relevant persons who opt into the service, therefore allowing fishers to plan their voyages and avoid any interaction with the Seismic Vessel and towed equipment. Furthermore, if a commercial fisher does experience economic loss as a result of the Otway Basin 3D MC MSS, they may submit a compensation claim under the Commercial Fisheries Compensation Protocol, with this claim assessed by an independent third-party assessor. The potentially significant action of adjusting survey lines to accommodate commercial fishers greatly outweighs the limited potential benefit gained.	No
No seismic acquisition during the peak juvenile southern bluefin tuna migration and the timing of most SBTF (purse seine) operations (December to April).	P = No E = Limited	December to March represents a period when weather and sea conditions are likely to be favourable to seismic acquisition. Based on the weather and sea state analysis, seismic acquisition is most likely to be possible from October to March, with December to March the most favourable and periods outside of this potentially having too much weather downtime. The period when pygmy blue whales may be foraging in the region also occurs in the summer months and there is the possibility that controls to avoid disturbing and displacing this species could also indirectly limit acquisition during the same months as the tuna migration. However, the timing of both southern bluefin tuna and pygmy blue whales are seasonally variable and excluding acquisition may unnecessarily exclude months when they are not actually present in the region. Excluding acquisition between December and March could mean that it is not possible to complete a survey phase. Seismic surveys have previously been undertaken near the continental shelf break in the Otway region and the GAB at the same time as fishing for southern bluefin tuna; both activities have been able to proceed noting from TGSs previous experience that they are typically able take place in different locations from one another. Over the last 10 – 11 years, large-scale seismic surveys have been undertaken in these regions at the same time as an upward trend in total allowable catch and steady or increasing catch rates in both the purse seine and east coast long line fisheries, suggesting no apparent disruption to juvenile southern bluefin tuna migration. The potentially significant cost of excluding December to April to the survey greatly outweighs the limited potential benefit gained.	No

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
No seismic acquisition from April to December to avoid interactions with fishers in the ETBF.	P = No E = Limited	During stakeholder consultation, the industry association, Tuna Australia, identified the potential future increase in longline effort in the ETBF in waters off VIC and TAS. Southern bluefin tuna are caught by the ETBF under the same quota as the purse seine sector of the fishery that typically operates of South Australia. ETBF boats also target southern bluefin tuna during the winter months when the adult fish become available to the longline method. The amount caught is dependent on the available quota after the purse seine sector has finished its catching season. Tuna Australia requested that the Otway Basin 3D MC MSS avoid the period April to December to avoid impacts to long line fishers in the ETBF. This period is the opposite of the period fished for juveniles by the purse seine sector. It is likely that winter months will already involve significant periods of downtime due to unfavourable weather and sea states. However, exclusion of the period April to December also risks months when conditions are favourable for survey activities. Excluding these months may mean that it is not possible for a survey phase to be completed or even to proceed. Seismic surveys have previously been undertaken near the continental shelf break in the Otway region and the GAB at the same time as fishing for southern bluefin tuna; both activities have been able to proceed noting from TGS previous experience that they are typically able take place in different locations from one another. It is noted that survey and future long lining could target similar areas at the same time of year. TGS will communicate with fishers throughout any survey phase and, where practicable, will avoid areas of fishing activity. However, excluding the period April to December is not considered practicable.	No
Daily contact with relevant persons to update on survey plans.	P = No E = Effective	It would not be possible to contact all relevant persons on a daily basis, particularly recreational users. If requested, relevant persons will be notified every 24 hours with the 48-hour look-ahead of vessel movements, a Notice to Mariners will be in place throughout the duration of the Otway Basin 3D MC MSS, and the survey vessels will be contactable on marine radio.	No
Seismic acquisition will only occur outside of fishing seasons.	P = No E = Effective	As there will be some commercial fishing activities year-round (see **Table 37**), TGS are unable to operate outside of all fishing seasons.	No
Vessel master of the Seismic Vessel will take evasive action to avoid marine fauna and other marine users.	P = No E = Ineffective	The Seismic Vessel has limited ability to manoeuvre. It is unlikely any attempt to avoid a collision will have the desired result. The Seismic Vessel will instead maintain a constant speed and will not deviate from survey lines with the exception of line turns.	No
Seismic acquisition will only occur during daylight hours to allow for visual identification of the Seismic Vessel and towed equipment.	P = No E = Limited	24/7 operations will occur to minimise the duration of the survey. This measure would result in significant extensions to the time required to acquire survey data. Interactions between the Seismic Vessel and other marine users could still potentially occur during daylight hours. The vessels associated with the Otway Basin 3D MC MSS will display the appropriate navigation lights and will use ARPA and AIS for identification to other vessels. Vessels will be contactable through radio-communications at all times. The towed equipment will be visually identifiable through display of lights, radar reflectors and use of AIS transponder on the tail buoys to mark the end of all the streamers. Costs would be disproportionate to the benefit gained.	No
No seismic acquisition within major shipping routes.	P = No E = Limited	Major commercial shipping routes are generally based on a direct line from major ports, and it has been shown that there is some overlap with the OA. Avoiding these shipping routes would result in very large data gaps meaning that the Otway Basin 3D MC MSS would not meet survey objectives. Numerous control measures will be implemented during the Otway Basin 3D MC MSS, such as the use of AIS and radar on the Seismic Vessel and towed equipment, broadcasting of Notices to Mariners, and radio contact with Seismic Vessel will reduce the likelihood of any interactions with commercial vessels. These measures are considered sufficient to manage vessel interactions. Commercial vessels are able to plot courses and manoeuvre themselves to avoid the Seismic Vessel without compromising their overall transit times, especially with the advanced notification they will receive. Costs would be disproportionate to the benefit that may be gained.	No

Control measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Use of additional support vessels to further reduce the potential for collision or interference with other marine users.	P = No E = Limited	The use of additional support vessels may minimise interactions with other marine users as it allows for communication and management of interactions if there is an interaction with more than one approaching vessel. However, the use of additional support vessels adds increased risk to marine mammals as the additional vessels in the water pose a further collision risk. The use of additional support vessels would result in significant costs that would be detrimental to the commerciality of the survey. Costs would be disproportionate to the benefit to other marine users that is gained, and also would increase risk to marine fauna.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Residual Risk Ranking**
Marine Reptiles	Minor	Unlikely	Low
Marine Mammals	Minor	Unlikely	Low
Seabirds	Minor	Unlikely	Low
Commercial Fisheries	Minor	Likely	Low
Commercial Shipping	Minor	Likely	Low
Tourism and Recreation	Negligible	Unlikely	Negligible
Petroleum Exploration and Production Operations	Minor	Unlikely	Low
ALARP Statement			
The decision context has been assessed as Type B and the overall residual risk has been determined to be Negligible to Low. TGS considers the adopted control measures minimise the risk of impacts from the presence of the Seismic Vessel and towed equipment and are appropriate to the localised nature and small scale of the predicted environmental impacts associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements, good industry practice, using professional experience and considering the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Additional control measures were considered as part of the assessment process; however, it was considered that they did not provide any further environmental benefit or were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from the physical presence of the Seismic Vessel and towed equipment are reduced to **ALARP.**			

7.1.6 Impact and Risk Acceptability

Table 58 Demonstration of General Impact and Risk Acceptability for Physical Presence of Seismic Vessel and Towed Equipment

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to range from **Negligible** to **Low**.
Ecologically Sustainable Development	The management of the impacts associated with the presence of the Seismic Vessel and towed equipment proposed by TGS can be carried out in compliance with principles of ESD as defined within the EPBC Act. There is no threat of serious or irreversible environmental damage or significant impact to biological diversity and ecological integrity associated with disruption/interference with other users during the Otway Basin 3D MC MSS. Therefore, the impact is considered to be consistent with the principles of ESD.
TGS Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	It is considered that the physical presence of the Seismic Vessel and towed equipment will not result in any significant impact on environmental values or sensitivities within the OA, including protected species such as marine mammals, marine turtles, and seabirds. The OA overlaps BIAs for the following species which may be affected by the physical presence of the survey vessels and towed equipment: pygmy blue whale, southern right whale, wedge-tailed shearwater, short-tailed shearwater, wandering albatross, Antipodean albatross, Australasian gannet, white-faced storm-petrel, common diving-petrel, Bullers albatross, shy albatross, Indian yellow-nosed albatross, black-browed albatross, and Campbell albatross. Other protected species have been identified as potentially present within the OA but do not have a BIA that overlaps with the boundaries of the OA. The potential impacts from the physical presence of the survey vessels and towed equipment will be of similar nature and scale to commercial vessels which traverse or utilise (e.g. commercial fishing vessels). Notably, the OA already experiences a high level of shipping traffic and the Otway region has been subject to previous MSSs. The Seismic Vessel will be transit at a speed of 4.5 knots along predetermined sail lines, meaning that there is the capacity for relevant persons to plan around the activity where consultation has occurred, and notification provided. The predicted impacts to the identified environmental receptors are considered to be minor and short-term, and managed through the implementation of control measures such as temporal and spatial exclusions around marine mammal BIAs and compliance with relevant legislation around vessel approach when in the presence of marine mammals. The impacts to commercial fishers are considered to be managed through the implementation of TGSs Commercial Fisheries Compensation Protocol, and the extensive consultation programme which includes communication with relevant persons for the life of the Otway Basin 3D MC MSS.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the physical presence of the Seismic Vessel and towed equipment has been determined to range between Low to Moderate and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. **Conservation Management Plan for the Blue Whale;** **Conservation Management Plan for the Southern Right Whale;** **Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale); and** **Conservation Advice for Sei and fin Whales** Minimising vessel collision has been ranked as a high priority action within the Conservation Management Plans for blue whale, southern right whale, humpback whale, fin whale and sei whale. During the development of mitigation measures for the Otway Basin 3D MC MSS, the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna has been taken into account, reducing the potential for risks associated with ship strike to **ALARP** and **Acceptable Levels** with regard to marine mammals. **Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017)** The Recovery Plan for Marine Turtles in Australia outlines that the long-term recovery objective for marine turtles is to '*minimise anthropogenic threats*' and to '*allow for the conservation status of marine turtles to improve so that they can be removed from the EPBC Act threatened species list*'. Although the OA does not represent an area of high importance to marine reptiles (i.e. no marine reptile BIAs have been identified within or near the OA), the National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna was taken into account during the development of mitigation measures and mitigation measures specific to marine reptiles will be implemented during the Otway Basin 3D MC MSS (e.g. installation of turtle guards on tail buoys). The low speed of the Seismic Vessel and installation of turtle guards on each tail buoy is considered to further reduce the potential for risks associated with vessel disturbance to **ALARP** and **Acceptable Levels** regarding marine turtle populations. **AMP Values, Management Prescriptions and IUCN Reserve Management Principle** The environmental and socio-economic values of the AMPs will not be impacted by the physical presence of the Seismic Vessel and towed equipment. Therefore, the management measures are consistent with the IUCN management prescriptions and permissible use of the AMPs. **Conservation Values and objectives of the South-East Marine Reserves Management Plan** The physical presence of the Seismic Vessel and towed equipment are not expected to impact significantly on the environmental values or sensitivities of the SEMR at a local or regional level.

<table>
<tr><th>Criteria for Acceptance</th><th>Acceptability Summary</th></tr>
<tr><td>Social Acceptance – Relevant persons expectations</td><td>Some relevant persons have noted concerns regarding the potential for the Otway Basin 3D MC MSS to impact on SBTF fishing operations. Control measures have been proposed to manage seismic acquisition with the industry.

One relevant person advised that as quotas for southern bluefin tuna increase, the long lining sub-fishery of the SBTF (associated with long liners in the ETBF) may expand in the coming years from the east coast to include a greater level of fishing and searching for new fishing grounds off TAS and VIC. The quota fished by the long line sub-fishery occurs after the quota by the purse-seine fishery has been caught or the season ended, therefore, long liners tend to fish between April and December (the opposite of the purse seine sub-fishery). Long liners may also access deeper offshore waters than the purse seine sub-fishery. Given limited previous effort by long liners in this area (<5 vessels effort reported for the ETBF in waters offshore from Portland) the potential extent and magnitude of interactions is difficult to predict until such shifts in the fishery occur. Generally, it is considered that a survey phase could limit the ability of long liners to access new fishing grounds in the area. However, given that a survey phase will occupy a discrete area and SBT are highly mobile throughout this region, alternative areas will be accessible outside of the survey phase.

Fishers in the TAS giant crab and rock lobster fisheries raised concerns about impacts to their fisheries. The exclusion of acquisition within water depths less than 1,000 m adjacent to the TAS fisheries was requested. Noting that the TAS giant crab stock is currently assessed as depleted, TGS have adopted the requested exclusion.

Rock lobster fishers acknowledged that that the survey is mostly located offshore in deep waters that avoid most rock lobster fishing effort, but on behalf of its members, noted concerns regarding the effects of seismic on the fisheries. They also explained that some deep-water fishing effort occurs occasionally for white lobster and requested that the survey be modified to avoid these areas. Although no such exclusion has been adopted by TGS for rock lobster, the AA already avoids depths and most areas where any fishing effort has previously occurred. The exclusion zone defined for TAS giant crab also has some indirect benefit in this respect for rock lobster. No significant impacts to rock lobster fishing activities are expected.

All concerns raised by relevant persons were considered as part of the EP process and responses were provided to all submissions with further information or feedback as necessary. Results of the impact assessments have been summarised and provided to all relevant persons, when requested. Engagement with all relevant persons will continue for the duration of the EP. All submissions and associated response are provided in Appendix K. Detailed literature reviews were included in the development of the EP and an extensive set of control measures to reduce the overall impacts from the Otway Basin 3D MC MSS on the marine environment and those relevant persons that use the marine environment for their economic wellbeing, to ALARP and an Acceptable Level</td></tr>
<tr><td>External Context – Commonwealth and State Legislative Criteria</td><td>The control measures for reducing the risk associated with the physical presence of the Seismic Vessel and towed equipment throughout the duration of the Otway Basin 3D MC MSS are consistent with the following relevant standards/documents:
International Maritime Organisation (IMO) conventions including STCW and SOLAS;
Relevant ship safety requirements under the Navigation Act 2012:
COLREGS;
Marine Order 21: (Safety of navigation and emergency procedures), 2012;
Marine Order 28: (Operations standards and procedures), 2012;
Marine Order 30: (Prevention of collisions), 2009; and
Marine Order 58: (Safe management of vessels), 2020
Offshore Petroleum and Greenhouse Gas Storage Act 2006 and associated (Environment) Regulations;
Watch-keeping will occur in accordance with the standards set by the ‘International Convention on Standards of Training, Certification and Watchkeeping for Seafarers’; and
Support vessels will adhere to the EPBC Regulations 2000 with regard to interacting with cetaceans.</td></tr>
<tr><td>Industry Best Practice</td><td>Implemented control measures are based on Industry Best Practice including:
The IAGC Environmental Manual for Worldwide Geophysical Operations. Geophysical vessels must exercise care to reduce risk to aquatic life, including marine fauna and other marine users and, where possible minimise interruption to operations and equipment of other marine users; and
The APPEA Code of Environmental Practice Details within this document relate mainly to offshore operations such as offshore exploration and/or drilling and production facilities where disturbance to marine fauna and other marine users should be reduced to ALARP and Acceptable Levels. It emphasises the importance of maintaining public health and safety during all phases of operations.</td></tr>
<tr><td>ALARP</td><td>The total elimination of survey vessels and towed equipment from the project cannot be achieved due to the offshore location of the OA for the Otway Basin 3D MC MSS, lack of commercially available and proven alternative acquisition methods, and health and safety requirements for a MSS. Following the implementation of the control measures, the potential impacts to the marine environment and other marine users arising from the physical presence of the Seismic Vessel and towed equipment will be short-term and restricted in extent to within the immediate vicinity of the vessels and equipment.

Based on the discussions within the EP, including the potential impacts on the environment and the associated control measures to be implemented, the residual risk of impacts arising from the physical presence of the Seismic Vessel and towed equipment throughout the Seismic Survey is considered to be Negligible to Low. It is envisaged that the control measures, especially the temporal and spatial controls will avoid displacement to the sensitive stages of PBW and SRW, as will the adaptive management measures in the BIA. Compensation to commercial fishers through the development of the Commercial Fisheries Compensation Protocol will ensure that commercial fishing licence holders do not experience increased cost encumbrance or loss of income.

With the control measures in place, it is considered that the Otway Basin 3D MC MSS will be acquired so that the environmental impacts and risk on the marine environment and associated receptors within and surrounding the OA are reduced to ALARP.

Therefore, residual risk from the physical presence of the Seismic Vessel and towed equipment associated with the Seismic Survey is considered to be at an Acceptable Level.</td></tr>
</table>

Table 59 Demonstration of Specific Impact and Risk Acceptability for Physical Presence of the Seismic Vessel and Towed Equipment

Receptor Category	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
Commercial Fisheries	The peak industry body representative for commercial fishing, raised concerns regarding the potential effects of the Seismic Survey on commercial catch level and displacement from fishing grounds. Commercial fisheries data and publications used to inform the impact assessment include: • ABARES Fishery Status Reports 2021 (Patterson *et al*., 2021); • Commercial fishing catch and effort data for the recent five-year period 2016 – 2020 was obtained from the ABARES, VFA, DNRET and PIRSA which allowed spatial and temporal patterns in fisheries catch and effort distribution to be assessed; and • TGS commissioned the SETFIA to compile an additional review of the level of catch made by Commonwealth and State-managed fisheries within the OA, the proportion of each fisheries' total allowable catch and the annual average catch value that it represents (based upon data from the ten years prior to 2021).	Seismic activities are undertaken in a manner such that: • No interference with other marine users occurs to an extent greater than is necessary for the exercise of right conferred by the titles granted to carry out exploration activities. • There is no change to the sustainability status of the fishery; the Otway Basin 3D MC MSS is undertaken in a manner that does not result in serious, irreversible or long-term impacts to key indicator commercial fish populations and to the extent that sufficient spawning fish biomass and recruitment of the stocks may be maintained such that stocks continue to be assessed by DPIRD as sustainable. • There is no increased costs or loss of income for commercial fishing license holders.	• The predicted level of interference to commercial fisheries is no greater than is necessary to exercise of right conferred by the titles granted to carry out exploration activities; • TGS will be requesting all marine traffic remain 10 km away from the Seismic Vessel and the towed streamers, this will essentially create a moving temporary exclusion zone around the Seismic Vessel. • Displacement to fisheries as a result of the physical presence of the Seismic Vessel and towed equipment are likely to be localised and short-term. • The physical presence of the Seismic Vessel and towed equipment are not predicted to impact key indicator commercial fish populations, thereby having negligible effect on the overall sustainability status of the fishery. • A Giant Crab Acoustic Exclusion area will be implemented during the Otway Basin 3D MC MSS in water depths shallower than 1,000 m on the south-eastern boundary, within which there will be no activation of the acoustic source. This will protect giant crabs fished within the TAS giant crab fishery, and will also by default offer protection to rock lobster habitat. • A Commercial Fishing Compensation Protocol will be implemented to formally manage claims by commercial fishers for loss of catch, displacement and lost or damaged fishing gear as a consequence of the Otway Basin 3D MC MSS.	Yes

Acceptability Statement
Impacts and risks classified as 'Type B' or above are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined Acceptable Levels for that impact or risk, including those described in **Table 52.** Based on the above evaluation, the potential impacts from the physical presence of the Seismic Vessel and towed equipment meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of the physical presence of the Seismic Vessel and towed equipment on all receptors, including the associated disruption and interference with other marine users to an **Acceptable Level.**

7.1.7 Environmental Performance

Table 60 Environmental Performance Outcomes, Standards and Measurement Criteria for Physical Presence of the Seismic Vessel and Towed Equipment

Number	Environmental Performance Outcome	Environmental Performance Standard(s)
EPO 1	Seismic acquisition is undertaken in a manner such that it does not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted to carry out exploration activities.	**EPS 1** to **EPS 3**, **EPS 10** to **EPS 11**, **EPS 19** to **EPS 27**, **EPS 43**, and **EPS 46** to **EPS 50**
EPO 2	Seismic acquisition is undertaken in a manner that prevents any increased cost encumbrance or loss of income to commercial fishing license holders.	**EPS 1** to **EPS 2**, **EPS 19** to **EPS 39**, **EPS 43**, and **EPS 46** to **EPS 52**
EPO 3	Seismic acquisition is undertaken in a manner that limits impacts due to collision or entanglement with vessels or in-water seismic equipment to individual listed threatened, listed migratory or listed marine fauna protected under the EPBC Act to minor, short-term effects and ensures biologically important behaviours can continue.	**EPS 1** to **EPS 2**, **EPS 12** to **EPS 18**, **EPS 40** to **EPS 42**, and **EPS 44** to **EPS 49**.

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 1**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS Vessel Operations Manager (**TGS VOM**) Onshore Environmental Advisor (**EA**)
	EPS 2: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM Seismic Contractor Vessel Operations Manager (**VOC**) EA Vessel Master Survey Environmental Advisor (**SEA**)
All survey vessels will adhere to the requirements of the national and international legislation, including the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of SOLAS as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21, 28, 30, 58 and the STCW Convention. The requirements give effect, but are not limited to, the following: • Appropriate use of lighting, navigation and radio communication at sea; and • 24-hour bridge and radar watch by qualified watch-keepers to monitor for other marine users.	**EPS 3**: At all times the Vessel Masters comply with the requirements of national and international legislation and conventions including (but not limited to) the Navigation Act 2012 (specifically Marine Order Part 21, 27, 30, 58) COLREGS, Chapter IV (Radio communications) and Chapter V (Safety of Navigation) of SOLAS (International Convention on the Safety of Life at Sea 1974) and the STCW Convention.	Vessel Crew Training and Competency records demonstrate that all relevant marine crew are competent to STCW95/Elements of Shipboard Safety Standards. Pre-mobilisation audit and inspection are completed prior to operations and identify no records of survey vessels failing to comply with appropriate navigation and communication requirements under the Navigation Act 2012, associated Orders or conventions. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief SEA
	EPS 4: Lighting and communications equipment onboard all vessels to adhere with COLREGS, the *Navigation Act 2012* and with AMSA Marine Orders Part 30: Prevention of collisions, Part 21: Safety and emergency arrangements and Part 27 (safety of navigation and radio equipment).	Pre-mobilisation audit and inspection are completed prior to operations and identify no records of survey vessels failing to comply. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 5: The Seismic Vessel displays day shapes and lights (during hours of darkness/poor visibility) to indicate that the vessel is towing equipment resulting in the Seismic Vessel being restricted in its ability to manoeuvre.	Pre-mobilisation audit and inspection are completed prior to operations and confirm that the relevant equipment is onboard, tested and operational. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 6: The survey vessels are equipped with Radar and AIS systems which will be operating and monitored at all times for both transmitting and receiving vessel positions in the surrounding vicinity.	Pre-mobilisation audit and inspection are completed prior to vessel leaving port and confirm Radar and AIS are present and operational. Bridge logs confirm Radar and AIS are used during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 7: The Seismic Vessel will have ARPA onboard for the detection of other vessels. The ARPA system can track other vessels speed and heading and can monitor for the potential of any collisions so the vessels can be contacted prior to any situation occurring.	Pre-mobilisation audit and inspection are completed prior to vessel leaving port and confirm ARPA are present and operational. Bridge Logs confirm ARPA is used during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 8: The survey vessels will have the appropriate communication equipment onboard and will be contactable and also able to communicate with other vessels by radio at all times (i.e. VHF and SSB radio).	Bridge logs confirm VHF and SSB radio communications are always available.	Vessel Master Party Chief
	EPS 9: Qualified crew maintain 24/7 watch-keeping during the survey in compliance with the STCW Convention. Watch keeping duties includes monitoring of vessel position (radar and plotter) and water depth at all times during seismic acquisition.	Bridge logs verify watch has been undertaken during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 10: Watch keepers are qualified in accordance with STCW95 (or equivalent).	Pre-qualification process includes requirement for Contractor to review/provide qualifications/training of crew members. Induction records outline qualifications/training of all crew members.	VOC Vessel Master
Adherence to the prohibition of entry into established Petroleum Safety Zones surrounding petroleum wells, structures, or equipment.	**EPS 11**: The Seismic Vessel will not enter within any established PSZ. There are no PSZ's within the OA; however, if for any reason the survey vessels did have to enter a PSZ, this would only be by prior arrangement with the installation master and all correct permits are obtained.	Bridge logs records demonstrate compliance.	Vessel Master
Vessel masters' of the support vessel/s will comply, when safe to do so, with the relevant requirements of EPBC Regulations 2000 Part 8, Division 8.1, including: • Taking action to avoid approaching or drifting closer than 50 m to an adult dolphin or 100 m to an adult whale; • Taking action to avoid approaching or drifting closer than 150 m to a dolphin calf or 300 m to a whale calf; • Making all efforts not to let a calf enter the caution zone; and • Not exceeding a speed of six knots within the caution zone of a cetacean (300 m).	**EPS 12**: The Support Vessel/Chase Vessel will not intentionally approach or allow their vessel to drift closer than 100 m to any adult whale.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
	EPS 13: The Support Vessel/Chase Vessel Masters will not intentionally approach or allow their vessel to drift closer than 50 m from any dolphin.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
	EPS 14: The Support Vessel/Chase Vessel will not intentionally approach or allow their vessel to drift closer than 300 m to any whale calf.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
	EPS 15: If a cetacean approaches closer than the 100 m, the Vessel Master will either disengage gears or allow the whale to approach or reduce speed to less than 6 knots and steer a course away from the cetacean.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
	EPS 16: If a dolphin approaches closer than the 50 m, the Vessel Master must not change course or speed of the vessel suddenly.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
	EPS 17: The vessel master will make all efforts not to let a calf enter the caution zone (either whale or dolphin). However, if it occurs, the Vessel Master will immediately stop the vessel, turn off engines, or disengage gears, or withdraw the vessel from the caution zone at a constant speed of less than 6 knots.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Any vessel strike incident to marine mammals will be reported as soon as practicable via the National Vessel Strike Database within 72 hours of the incident.	**EPS 18:** Any vessel strike incident to marine mammals will be reported via the National Vessel Strike Database as soon as practicable yet no later than 72 hours following the incident.	MFO daily and weekly logs verify any vessel strike incident has been reported via the National Vessel Strike Database	MFOs SEA Client Site Representative (**CSR**)
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	**EPS 19**: Pre-survey consultation with relevant persons, confirming the Otway Basin 3D MC MSS will proceed, no less than four weeks before operations commence.	Documentation of consultation and consultation log demonstrate compliance.	TGS VOM EA
	EPS 20: Onshore personnel (EA) will communicate any updates determined through the continuing consultation process to the Vessel Master, where they have the potential to impact the Otway Basin 3D MC MSS and/or relevant persons.	Documentation of consultation and consultation log demonstrate compliance. Forms part of continuing consultation strategy.	EA Vessel Master
	EPS 21: Relevant persons will be notified following the conclusion of the survey as per the following Post-Activity Notifications: • All relevant persons – relevant time post completion; • AMSA – relevant time post completion; • NOPSEMA – 10 days post completion advising the completion of the Seismic Survey; and • NOPSEMA – As soon as practicable advising that all of the activities and obligations covered under the EP have been completed.	Documentation of consultation and consultation log demonstrate compliance.	TGS VOM EA
	EPS 22: A 48-hour 'look-ahead plan' will be provided to relevant persons (who register for the service) identified throughout the relevant persons consultation process, detailing the survey activities over the next 48 hours. The 48-hour look-ahead plans will be updated and issued every 24 hours and distributed to relevant persons via email.	Documentation of consultation, consultation log and issuing of weekly and 48-hour look-ahead plans demonstrate compliance. Forms part of continuing consultation strategy.	TGS VOM EA CSR Vessel Master
Notification to AHO for the publication of a Notice to Mariners of survey presence and towed array, no less than four weeks before operations commence.	**EPS 23**: A Notice to Mariners will be published and distributed by the AHO under the Navigation Act 2012, informing other marine users of the Otway Basin 3D MC MSS, no less than four weeks before operations commence.	Record of Notice to Mariners.	TGS VOM EA
	EPS 24: Should any changes occur the survey acquisition plan throughout the duration of the Otway Basin 3D MC MSS, all Notice to Mariners will be updated as soon as reasonably practicable.	An updated Notice to Mariners will be issued.	TGS VOM EA CSR Vessel Master
Notification to the JRCC for the promulgation of navigational warnings (i.e AUSCOAST warnings).	**EPS 25**: The JRCC will be contacted 24 – 48 hours prior to the commencement of survey operations for issuing of radio navigation warnings.	Record of notification to JRCC.	TGS VOM EA
At least one Support Vessel will accompany the Seismic Vessel when in operation and when safe to do so (e.g., outside of inclement weather periods), to manage interactions with other marine users.	**EPS 26**: The support vessel/s will manage vessel interactions through travelling between and maintaining communications with any third-party vessels in the OA.	Bridge logs verify support vessels have successfully communicated with all third-party vessels encountered in the OA.	Vessel Master
	EPS 27: In case of emergency, at least one support vessel will be capable of taking the Seismic Vessel under tow with all equipment deployed (to keep the vessel and in-water equipment under control and in forward motion).	Pre-qualification process includes assessment of support vessels capacity to take the Seismic Vessel under tow. Contractors QHSE Plan confirms how this will be achieved.	TGS VOM VOC Vessel Master
Compensation to fishers and vessel crews (i.e., the claimant) is demonstrated to have occurred for the following circumstances:	**EPS 28**: A Commercial Fisheries Compensation Protocol is in place for the Otway Basin 3D MC MSS.	Documentation of consultation demonstrates Fisheries Compensation Protocol for the Otway Basin 3D MC MSS is in place for the Otway Basin 3D MC MSS.	TGS VOM

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
• Interaction resulting in loss or damage to fishing equipment; • A temporary loss of fish landed catch due to damaged or lost fishing equipment; • Where displacement from fishing grounds results in additional costs incurred due to relocating; or • A temporary reduction in fish landed catch due to the effects of acoustic emissions or displacement from fishing grounds. Claims received from fishers in any circumstances other than those outlined above will not be assessed. Claims will be considered provided the interaction/displacement/loss of catch took place in the Adjustment Area (plus any additional area of avoidance requested around the survey vessels and towed equipment.) where the Otway Basin 3D MC MSS took place, and within the project active time frame only.	**EPS 29**: Pre-survey consultation with commercial fishers known to utilise the OA, notifying them in writing of the Commercial Fisheries Compensation Protocol in place for the Otway Basin 3D MC MSS, no less than 28 days before operations commence. Notification will be via SETFIA, TSIC, SIV, or AFMA (as relevant to each fishery) and will be provided in the form of a map, showing the OA and associated Adjustment Area, plus digital files in formats such as shapefiles and a copy of the Protocol in full.	Documentation of consultation demonstrates the Commercial Fisheries Compensation Protocol is in place for the Otway Basin 3D MC MSS and was provided to commercial fishers known to utilise the OA no less than 28 days before operations commence. Information provided is demonstrated to include a copy of the Protocol in full, a map showing the OA and Adjustment Area, plus digital files in formats such as shapefiles.	TGS VOM
	EPS 30: Eligible Commercial Fishes have been provided application forms and contact point relevant to commercial fishers relating to lodging a claim or notification regarding loss of catch, displacement, or fishing gear loss of damage.	Documentation of consultation demonstrates Attachment A of the Commercial Fisheries Compensation Protocol was attached to the pre-survey consultation with commercial fishers known to utilise the OA, and that contact point has been provided to commercial fishers.	TGS VOM
	EPS 31: Subject to a claim being lodged, a suitably experienced/qualified independent person/organisation will be engaged as the assessor of the claim, in consultation with the claimant. Suitably experienced and qualified is defined as a person or organisation with proven demonstrated experience in data analysis and data auditing processes and procedures within the industry.	Documentation of consultation with claimant around engagement of independent assessor, appropriate experience/qualifications of independent assessor, and agreements in place between TGS and independent assessor to engage their services for assessing the claim.	TGS VOM
	EPS 32: TGS will provide the assessor with a letter of instruction/project brief, which is to also be provided to the claimant as part of the assessment report.	Documentation of communications with assessor and claimant including provision of letter of instruction/project brief.	TGS VOM
	EPS 33: All compensation claims made by commercial fishing license holders or vessel crews for equipment damage/loss, displacement and loss of catch will be assessed for merit in accordance with the processes outlined in the Commercial Fisheries Compensation, within 30 days of receiving the claim.	Records demonstrate that claims made by commercial fishery license holders and vessel crew were assessed in accordance with the processes outlined in the Commercial Fisheries Compensation Protocol.	TGS VOM
	EPS 34: Where a commercial fishing licence holder has been involved in an interaction leading to loss or damage to the licence holder's equipment or displacement from usual fishing grounds, all interactions between the commercial fishing licence holder and the survey vessels will be recorded by the MSS operator. Details to be recorded should include, but not be limited to the time, date and location coordinates of where the gear interaction occurred or the fishing was aborted and where it recommended, the name of the vessel, the licence holder number on the fishing gear, and any details of communications between the commercial fishing licence holder and the vessel/s.	Records demonstrate documentation of interactions with commercial fishing licence holder leading to loss or damage of the licence holder's equipment or displacement from usual fishing grounds.	Vessel Master
	EPS 35: Where possible and safe to do so, the Vessel Master shall make attempts to recover any fishing equipment. Photos will be provided to TGS by the Vessel Master.	Records demonstrate attempts to retrieved fishing equipment and photos of retrieved equipment.	Vessel Master.

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 36: The independent assessor is to provide TGS with an assessment report which is to include the following information: - A copy of the letter of instruction/project brief; - Confirmation (or otherwise) that the information provided in the claim is sufficient to conduct a meaningful assessment; - A summary of the claim details (survey, applicant, vessel, month/s); - For a loss of catch claim, monthly CPUE assessments as outlined in the Commercial Fisheries Compensation Protocol, including an estimation of any loss of catch and its market price; and - Any other information, comments, or views relevant to the assessment that the assessor may wish to include. Upon receiving and considering the assessment report, TGS will provide a copy of the report to the claimant and offer to meet with the claimant to discuss/address the claim.	Records demonstrate receipt of assessment report and consultation with claimant.	TGS VOM
	EPS 37: All claimants will be notified of the outcome of the claim (or request clarification/additional information from the claimant) as soon as practicable and within 30 days after receiving the application, in accordance with the Commercial Fisheries Compensation Protocol.	Records demonstrate claimants were notified of the outcome of the claim or request for clarification/additional information, within 30 days of receiving the claim, in accordance with the Commercial Fisheries Compensation Protocol.	TGS VOM
	EPS 38: All claimants considered to have a claim of merit will receive compensation, in accordance with the Commercial Fisheries Compensation Protocol, within 60 days of the claim determination. Claimants will be contacted via the email addressed provided within the claim application, unless requested otherwise. Compensation value paid will calculated based on the measures provided in the Commercial Fisheries Compensation Protocol.	Records demonstrate all claimants considered to have a claim of merit received compensation in accordance with the Commercial Fisheries Compensation Protocol, within 60 days of the claim determination.	TGS VOM
	EPS 39: In the event that a claimant disagrees with a claim assessment outcome, and an agreement cannot be reached between TGS and the claimant, the claimant may, within 30 days, opt to request that a suitably experienced/qualified independent third-party is engaged to review and determine the outcome of the claim. The appointment of the independent third party will be agreed mutually between TGS and the claimant. The dispute will be resolved within 60 days of dispute received by TGS, with the costs of engaging the independent third-party assessor covered by TGS.	Records demonstrate that a claimant's dispute has been assessed by a suitable experience/qualified independent third-party, where requested, and that costs of engaging the independent third-party assessor have been covered by TGS. Records document outcome of the independent third-party assessor's assessment and that the dispute has been resolved within 60 days of receipt of the dispute.	TGS VOM
Development and implementation of Marine Fauna Mitigation Plan. Where possible and safe to do so, marine fauna entangled within in-water equipment will be extricated and returned to sea following the procedures provided within the Marine Fauna Mitigation Plan.	**EPS 40:** One of the roles of the MFOs onboard the Seismic Vessel is to develop a Marine Fauna Mitigation Plan, to be submitted to TGS prior to the pre-mobilisation survey and audit commencing. This plan will demonstrate the following, at a minimum: • MFOs are trained, dedicated and experienced; • Responsibilities and authorities of MFOs to ensure the plan is communicated and available to those roles that are required to implement the controls; • Communications protocols for relaying marine fauna observations to the Seismic Operator, Vessel Master and vessel crew as required. • Survey Plan – describes the proposed activity including location and timing, acoustic source and streamer configuration, equipment (vessels) and key geographic locations such as BIAs and nominated exclusion zones. • Implementation Plan – details how the marine fauna mitigation controls within the EP will be implemented; • Handling procedures for the retrieval of marine fauna entangled in towed equipment or seabirds on the vessels' deck.	Pre-mobilisation audit and inspection confirms the Marine Fauna Management Plan has been developed. Induction records outline the content of inductions and personnel present. MFOs daily and weekly logs and Bridge logs confirm the Marine Fauna Mitigation Plan is being implemented.	SEA CSR MFOs RA

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 41: When safe to do so, efforts will be made to extricate and return to sea, any marine fauna entangled within in-water equipment, as per the handling procedures outlined within the Marine Fauna Mitigation Plan.	MFO daily and weekly logs verify the processes followed in the event of marine fauna entanglements.	MFOs SEA CSR
Vessel crew will complete an environmental induction covering the requirements for vessel interactions with marine fauna.	**EPS 42:** Vessel crew will complete an environmental induction covering the requirements for vessel interactions with marine fauna prior to the commencement of activities associated with the Otway Basin 3D MC MSS.	Induction records outline content of environmental induction and attendees.	EA Party Chief SEA Vessel Master
Streamers will be marked with tail buoys.	**EPS 43**: The tail buoy on each streamer is appropriately marked to enable other marine users to determine the extent of the survey and associated array of towed equipment. Each tail buoy includes a radar reflector, lights and an AIS transponder to identify the end of each streamer to other vessels, especially those capable of receiving AIS data.	Pre-mobilisation audit and inspection are completed prior to vessel leaving port and confirm appropriate tail buoys are fitted to each streamer.	Vessel Master Party Chief SEA
Turtle guards will be installed on streamer tail buoys or tail buoys will be of a design that does not represent an entrapment risk to marine turtles.	**EPS 44:** Each streamer tail buoy will be fitted with protective 'turtle guards' that is appropriate for excluding turtles from entering gaps in the subsurface structure of the tail buoys or will be of a design that does not represent an entrapment risk to marine turtles.	Audit/inspection records verify turtle guards are installed or tail buoys are of a design that does not represent an entrapment risk to marine turtles.	Vessel Master Party Chief SEA
Vessels masters' of the support vessel/s will, when safe to do so, take action to avoid approaching or drifting closer than 50 m to a marine turtle or pinniped.	**EPS 45:** Vessels masters' of the support vessel/s will, when safe to do so, take action to avoid approaching or drifting closer than 50 m to a marine turtle or pinniped.	Bridge logs records demonstrate compliance. MFO daily and weekly logs verify compliance	Vessel Master MFOs
The acoustic source will only be deployed and retrieved within the bounds of the OA.	**EPS 46:** The acoustic source will be retrieved and brought onboard the Seismic Vessel when not required and will only be permitted to be in the water when in the bounds of the OA. The acoustic source will not be deployed or, when safe to do so, retrieved when outside the boundaries of the OA.	Bridge logs verify vessel track records and timing of retrieval events. Pre-mobilisation audit and inspection confirms exclusion polygons on survey vessel's navigation system have been developed and are available for use.	Vessel Master Party Chief CSR SEA
	EPS 47: Shape files will be loaded onto the survey vessels' navigation system outlining the boundary extents of the OA and AA.	Exclusion polygons on survey vessel's navigation system.	Vessel Master CSR SEA
Retrieval of any equipment accidentally lost at sea, including streamers, where it is safe and practicable to do so to ensure it does not become a risk to other marine users. Pressure activated streamer recovery devices will be fitted along the streamers.	**EPS 48:** Where practicable and safe to do so, any equipment accidentally lost at sea, including streamers, is retrieved.	Bridge logs verify vessel track records and timing of retrieval events.	Vessel Master Party Chief CSR SEA
	EPS 49: Pressure activated streamer recovery devices will be fitted along the streamers.	Audit/inspection records verify pressure activated streamer recovery devices are fitted along the streamers.	Vessel Master CSR SEA
Access to Seismic Vessel tracking information via Google Earth for fisheries relevant persons who have registered for the service.	**EPS 50:** Access to Seismic Vessel tracking information provided via Google Earth for fisheries relevant persons who have registered for the service.	Consultation log confirms that stakeholders who registered for the service received link for seismic survey vessel tracking information via Google Earth.	EA Vessel Master
Giant Crab Acoustic Exclusion Area within waters 1,000 m or less south of the 2D tie line AA.	**EPS 51:** No seismic acquisition will occur within the boundaries of the Giant Crab Acoustic Exclusion Area.	Bridge logs verify vessel track records and where activation of the acoustic source has occurred.	Vessel Master Party Chief CSR SEA
	EPS 52: Shape files will be loaded onto the survey vessels' navigation system outlining the boundary extents of the OA and AA and the Giant Crab Acoustic Exclusion Area.	Pre-mobilisation audit and inspection confirms exclusion polygons on survey vessel's navigation system have been developed and are available for use.	Vessel Master CSR SEA

7.1.8 Physical Presence Impact and Risk Summary

Based on the assessment above, including the identification of potential impacts on the environment and the associated control measures to be implemented, the residual risk of impacts arising from the physical presence of the survey vessels and towed equipment throughout the Otway Basin 3D MC MSS is considered to range from **Negligible** to **Low**, for the receptors identified.

The suite of control measures determined to be adopted have been developed in accordance with industry best practice and relevant legislation. In accordance with the Risk Ranking Descriptions in **Table 49**, where risk cannot be reduced to '**Low**', additional control measures must be evaluated to determine whether the risk is reduced to **ALARP**.

Additional controls have also been evaluated to determine whether they are effective and practicable to implement in **Table 57**. Where they are determined to effectively reduce the environmental impact and risk, and are practicable to implement, they have been adopted. Consequently, it is considered that the environmental impacts and risk on the identified receptors arising from the physical presence of the Seismic Vessel and towed equipment throughout the duration of the Otway Basin 3D MC MSS, are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4,** the suite of control measures, are considered appropriate to manage the impacts arising from the physical presence of the Seismic Vessel and towed equipment on all receptors, specifically commercial fishers, to an **Acceptable Level.**

7.2 Acoustic Disturbance to the Marine Environment

7.2.1 Description of Source of the Impact and Risk

Noise will be generated from two sources during the Otway Basin 3D MC MSS, including the survey vessels, and the active acoustic source. The active acoustic source generates much higher noise levels than the vessels and would dominate overall underwater noise emissions at times when data acquisition is occurring.

7.2.1.1 Vessel Noise

Vessel noise (i.e. from propellers, machinery, and the passage of the hull through water) is the dominant anthropogenic sound in marine waters, adding to the constant ambient noise level in the marine environment. In general, older vessels produce more noise than more modern vessels, and larger vessels produce more noise than smaller vessels (Gordon and Moscrop, 1996). Commercial vessels produce relatively loud and predominantly low frequency sounds, with the exact characteristic's dependant on the type, size, and operational mode of the vessel (**Table 40**). A study undertaken by MacGillivray and Li (2018) recorded vessel noise in Haro Strait and found underwater noise generated by commercial vessels is significantly reduced at slower vessel speeds. For vessel noise, the strongest energy tends to be at frequencies below several hundred hertz, with source levels generally ranging from 180 – 190 dB re 1 µPa (Southall and Hatch, 2008).

Noise emissions from the survey vessels would be similar in level, frequency range, and character to noise from general shipping traffic already in the Otway Basin and is not considered to represent a significant additional environmental impact above the noise from normal shipping activities.

Table 40 Noise Outputs from a range of Commercial Vessels

Source	Source level (dB re 1 µPa at 1 m)	Reference
Container ship (294 m and 298 m length)	184.2 – 186.6 and 188.1	McKenna *et al.*, 2012
Container ship	183.8 – 199.1	MacGillivray and Li, 2018
Vehicle carrier (173 m and 199 m length)	180.0 and 180.8	McKenna *et al.*, 2012
Vehicle carrier	183.6 – 195.2	MacGillivray and Li, 2018
Bulk carrier (167 m and 229 m length)	187.4 and 185.1	McKenna *et al.*, 2012
Bulk carrier	181.9 – 193.9	MacGillivray and Li, 2018
Open hatch cargo ship (190 m and 213 m length)	183.8 and 181.1	McKenna *et al.*, 2012
Chemical products tanker (148 m and 182 m length)	182.4 and 184.9	McKenna *et al.*, 2012
Crude oil tanker (229 m and 243 m length)	181.3 and 182.1	McKenna *et al.*, 2012
Product tanker (180 m and 228 m length)	181.8 and 182.7	McKenna *et al.*, 2012
Tanker	183.6 – 195.2	MacGillivray and Li, 2018
Super tanker (266 m and 337 m length)	187 and 185	Thiele, 1983
Cruise ship	175.5 – 198.3	MacGillivray and Li, 2018
Fishing trawler	158	Malme *et al.*, 1988

7.2.1.2 Underwater Acoustic Modelling

7.2.1.2.1 Introduction

Underwater Acoustic Modelling (**UAM**) was undertaken to predict received noise levels, or the 'footprint' of acoustic emissions generated from the Otway Basin 3D MC MSS. UAM increases the understanding of the acoustic footprint over a given bathymetric environment with unique environmental parameters (i.e. sound speed profile and geology) and incorporates the characteristics of the specific acoustic source for any proposed seismic survey.

The results generated by the UAM process are used to develop appropriate Precaution Zones as required under Policy Statement 2.1 and to enable an assessment of the potential risk to marine fauna of interest from the OA based on comparisons with known injury and behavioural onset thresholds. Potential risks to the ecological character of sensitive marine areas in the vicinity of the OA are also considered.

For the proposed Otway Basin 3D MC MSS, UAM was undertaken by JASCO. The resulting UAM report (Welch *et al*., 2023) provides a comprehensive description of the methodology and results, and is included as **Appendix B**.

In summary, the UAM approach involved three key components:

- Array source modelling – used to predict acoustic signatures and spectra accounting for individual airgun volumes, airgun bubble interactions, and array geometry. This modelling is used to yield accurate source predictions;
- Underwater acoustic propagation modelling – used to estimate sound levels over a large area around the acoustic source, considering source directivity and range-dependent environmental properties likely to be encountered within the OA. Single-impulse (or per-pulse) and accumulated (24 hour) sound exposure levels (**SELs**) were predicted; and
- Animal movement and exposure modelling (**animat modelling**) – this modelling considers the movement of both the acoustic source and species of interest over time. In this case, the animat modelling involved simulations to predict the distance at which foraging pygmy blue whales (*Balaenoptera musculus brevicauda*) and migrating southern right whales (*Eubalaena australis*) are expected to be exposed above specified thresholds.

In the case of the Otway Basin 3D MC MSS, UAM was conducted specifically for the discharge of the 3,480 in^3 source array. If the final source utilised for the Otway Basin 3D MC MSS differs to that modelled by Welch *et al*. (2023), additional modelling will be undertaken to confirm that the far-field horizontal source level specifications are consistent with those assessed in this EP. As described in **Appendix B**, the sound speed profile for the month of September was selected on account of its slightly upward refracting characteristics that represent the worst-case scenario for noise propagation. This promotes the prediction of worst-case environmental impacts and therefore ensures that controls developed to address these impacts are precautionary.

Geoacoustic parameters used for modelling at all sites were derived from sedimentary grain size measurements from the Australian Government's Marine Sediments (**MARS**) database (Heap, 2009). On average, the surficial grain size on the continental slope indicates silty sand is present. For the deeper sites, the substrate is characterised by clayey sand, but as depth increases past ~200 m the sediment becomes lithified (Feary, 2000).

7.2.1.2.2 Modelling Scenarios

For the purpose of the UAM, the OA was divided into three Assessment Areas with a nominal acquisition scenario defined for each. Sixteen single impulse sites were defined across the three Assessment Areas, as well as five standalone sites, including two sites that were selected to be representative of the 2D tie line. The locations of the modelled sites are illustrated in **Figure 75**. Water depths across all sites ranged from 114 to 4,252 m. Since the original modelling was undertaken, the OA has been reduced in size meaning that Area 3 now lies outside the boundary of the OA. However, Area 3 modelling results are still considered to be relevant for sites with similar seismic source orientation and environmental properties (i.e. bathymetry, sound speed profile and geology of the seabed). Both versions of the OA (original and revised) are shown in **Figure 75**. A speed of 4.5 knots and an inter-pulse interval of 12.5 m was assumed. At the time and location of each seismic pulse, the modelled source location with the closest distance was selected for exposure modelling.

The single impulse sites and accumulated SEL scenarios were determined based on a proposed survey line plan, considering proximity to key features and inclusive of depths that support the greatest sound propagation towards the BIAs near the OA. The acquisition period for each scenario excludes turn duration, as the acoustic source will shut down during line turns. The single impulse sites and accumulated SEL scenarios are considered representative of the range of water depths for locations within the OA where the acoustic source will be active and the potential sound propagation characteristics that may arise during survey acquisition. Seafloor sound levels were assessed at nine different representative depths within the OA. Only seafloor sound levels were assessed at the two sites along the 2D tie line, and the depths were chosen to be representative of relevant densities and distributions for seafloor invertebrates.

Additional sound pressure level (**SPL**) receiver locations were chosen at key BIAs to assess possible impacts to PBWs, SRWs and Australian sea lions.

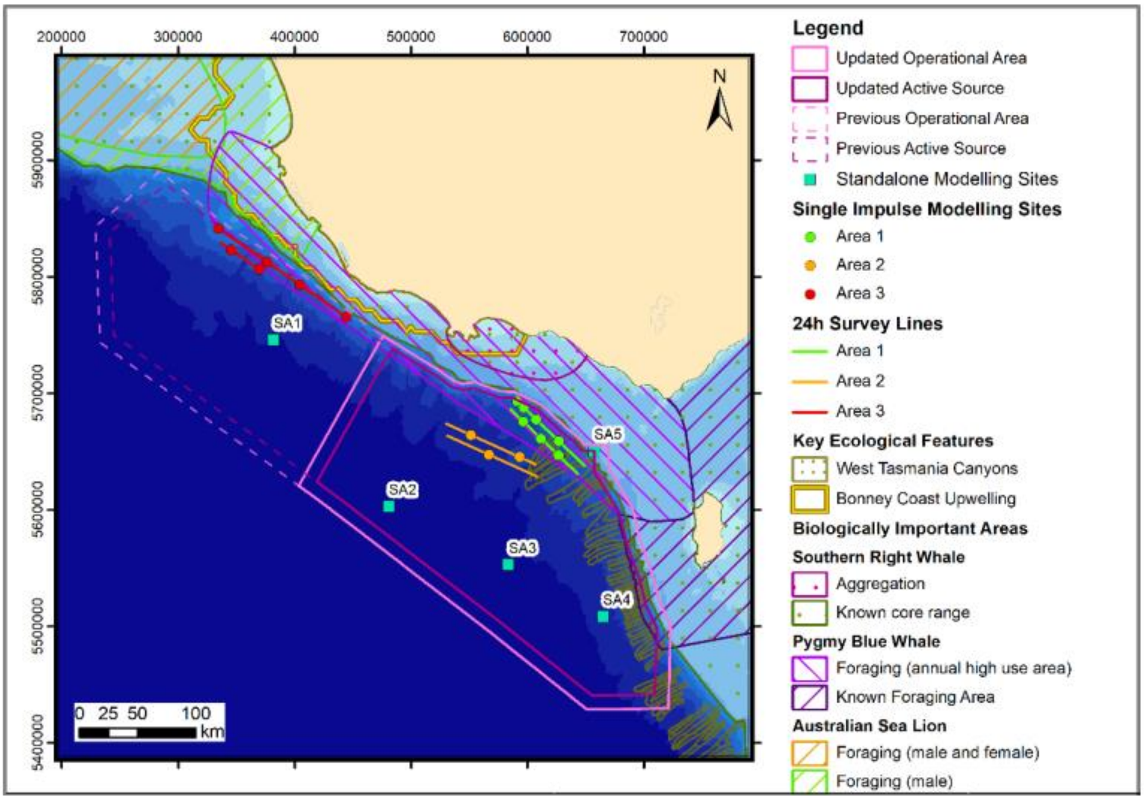


Figure 75 Overview of Modelled Sites and Acquisition Lines

7.2.1.2.3 Noise Effect Criteria

The following discussion is based on, and in some cases an excerpt from, the UAM contained within **Appendix B**, by Welch *et al*. (2023).

The perceived loudness of sound, especially impulsive noise such as from an acoustic source, is not generally proportional to the instantaneous acoustic pressure. Rather, perceived loudness depends on the pulse rise-time and duration, and the frequency content. Several sound level metrics are commonly used to evaluate noise and its effects on marine life. The period of accumulation associated with SEL is defined, referencing either a "per pulse" assessment or over 24 hours (**Appendix B**). The acoustic metrics used reflect the updated ISO standard for acoustic terminology, ISO/DIS 18405:2017 (2017).

Whether acoustic exposure levels might injure or disturb marine mammals is an active research topic. Since 2007, several expert groups have developed SEL-based assessment approaches for evaluating auditory injury, with key works including Southall *et al*. (2007), Finneran and Jenkins (2012), Popper *et al*. (2014), United States National Marine Fisheries Service (NMFS 2018), and Southall *et al*. (2019). The number of studies that have investigated the level of behavioural disturbance to marine fauna by anthropogenic sound has also increased substantially.

For benthic invertebrates, available literature suggests particle motion, rather than sound pressure, is a more important factor for crustacean and bivalve hearing. Particle motion relates to the movement of fluid particles in a sound field. Water depth and acoustic source size are related to the particle motion levels at the seafloor, with larger arrays and shallower water being related to higher particle motion levels, more likely relevant to effects on crustaceans and bivalves. Acoustic particle motion has been reported in terms of acceleration (ms^{-2}) at the seafloor.

The following noise criteria and sound levels for this study were chosen because they include standard thresholds, thresholds suggested by the best available science, and sound levels presented in literature for species with no suggested thresholds:

1. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24h}$) from (Southall *et al*., 2019) for the onset of Permanent Threshold Shift (**PTS**) and Temporary Threshold Shift (**TTS**) in marine mammals;
2. Marine mammal behavioural threshold based on the current US National Oceanic and Atmospheric Administration (NOAA, 2019) criterion for marine mammals of 160 dB re 1 µPa (SPL; L_p) for impulsive sound sources;
3. Sound exposure guidelines for fish, fish eggs and larvae (including plankton) (Popper *et al*., 2014);
4. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24h}$) from Finneran *et al*. (2017) for the onset of PTS and TTS in turtles;
5. Sea turtle behavioural response threshold of 166 dB re 1 µPa (SPL; L_p) (NSF 2011), as applied by the US NMFS, along with a sound level associated with behavioural disturbance 175 dB re 1 µPa (SPL; L_p) (McCauley *et al*.; 2000a; 2000b);
6. Peak-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$) and particle acceleration (ms^{-2}) at the seafloor to help assess effects of noise on crustaceans through comparing to results in Day *et al*. (2016), Day *et al*. (2019), Day *et al*. (2016a), Day *et al*. (2017) and Payne *et al*. (2008);
7. A sound level of 226 dB re 1 µPa (PK; L_{pk}) reported for comparing to Heyward *et al*. (2018) for sponges and corals;

8. An SPL human health assessment threshold of 145 dB re 1 µPa (SPL; L_p) for sound exposure to people swimming and diving derived from Parvin (2005), and considering Ainslie (2008); and
9. A squid/octopus startle (inking) response sound level of 162 dB re 1 µPa2s per-pulse SEL (L_E) (Fewtrell and McCauley 2012).

The modelling methodology considered source directivity and range-dependent environmental properties likely to be encountered in the OA. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p); zero-to-peak pressure levels (PK, L_{pk}); peak-to-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$); and either single-impulse (i.e., per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria outlined above. Further details of the relevant noise effect criteria used are presented in **Section 7.2.2.**

7.2.1.2.4 Acoustic Source Levels and Directivity

The source levels and directivity of the acoustic source presented in the UAM report included in **Appendix B** were predicted using JASCO's Airgun Array Source Model (**AASM**). AASM considers array layout including the volume, tow depth and firing pressure of each array component, and interactions between components. The acoustic source was modelled over AASM's full frequency range, up to 25 kHz.

Table 62 presents the peak and per-pulse SEL source levels in the horizontal-plane broadside (perpendicular to the tow direction), end-fire (along the tow direction), and vertical directions for the modelled triple 3,480 in^3 source. The vertical source level that accounts for the "surface ghost" (the out of phase reflected pulse from the water surface) is also presented to make it easier to compare the output of other acoustic source models.

Table 62 Far-field Source Level Specifications for the 3,480 in^3 Source for a 7 metre Tow Depth

Direction	Peak source pressure level ($L_{S,pk}$; dB re 1 µPa m)	Per-pulse source SEL ($L_{S,E}$; dB 1 µPa^{2}m^{2}s)	
		10–2000 Hz	2000–25000 Hz
Broadside	248.9	225.1	185.3
Endfire	247.7	224.9	190.4
Vertical	258.3	231.2	197.6
Vertical (surface affected source level)	258.3	233.8	200.6

Note: Source levels are for a point-like acoustic source with equivalent far-field acoustic output in the specified direction. Sound level metrics are per-pulse and unweighted.

7.2.1.2.5 Single-impulse Sound Fields

Acoustic source and propagation modelling was done at 16 single-impulse sites. The modelling assessed the per-pulse sound fields in terms of maximum-over-depth SPL, SEL, PK, and seafloor PK and PK-PK. These metrics were assessed as they are used for peak thresholds, as inputs into 24-hour SEL scenarios or correspond with the relevant behavioural thresholds.

The following per-pulse results are presented in Section 5.2 of **Appendix B**:

- Maximum and 95% distances to per-pulse SEL and SPL metrics for the water column;
- Threshold for diver human health;
- The SPL sound fields; and
- Maximum distances to maximum-over-depth water column PK thresholds.

Two examples of the SPL sound fields are presented in **Figure 76**. The implications of these results are discussed for the relevant environmental receptors in **Section 7.2.2**.

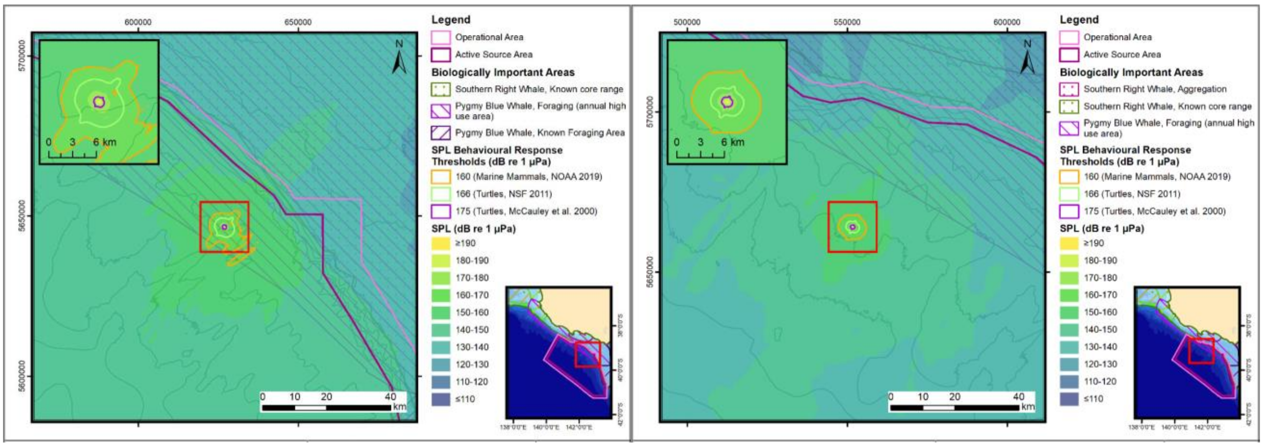


Figure 76 Example Sound Level Contour Maps of Unweighted Maximum-over-depth Water Column SPL Sound Field (Left: Area 1, Site 7; Right: Area 2, Site 2)

Specific modelling was undertaken to assess sound levels at the seafloor; receptor locations at 5 cm and 50 cm above the seafloor interface were assessed as being of relevance to benthic invertebrates, and sponges, corals, and fish respectively. These results are also provided in Section 5.2 of **Appendix B**.

In addition, JASCO modelled particle acceleration for a receiver 5 cm above the seafloor at nine water depths ranging from 114 m to 1,216 m. These were modelled to a maximum distance of 1,000 m from the centre of the acoustic source in the endfire and broadside directions. The results show that the effects are generally greater for the broadside directions than the endfire directions (as shown in **Figure 77** for both the deepest and shallowest sites). The particle acceleration threshold of 37.57 ms^{-2} (derived for scallops by Day *et al*. (2016)) was not predicted to occur at any range for any of the modelled sites.

The maximum predicted received SPL at the edge of each relevant BIA (PBW, SRW and Australian sea lions) are also presented in Table 35 of **Appendix B**.

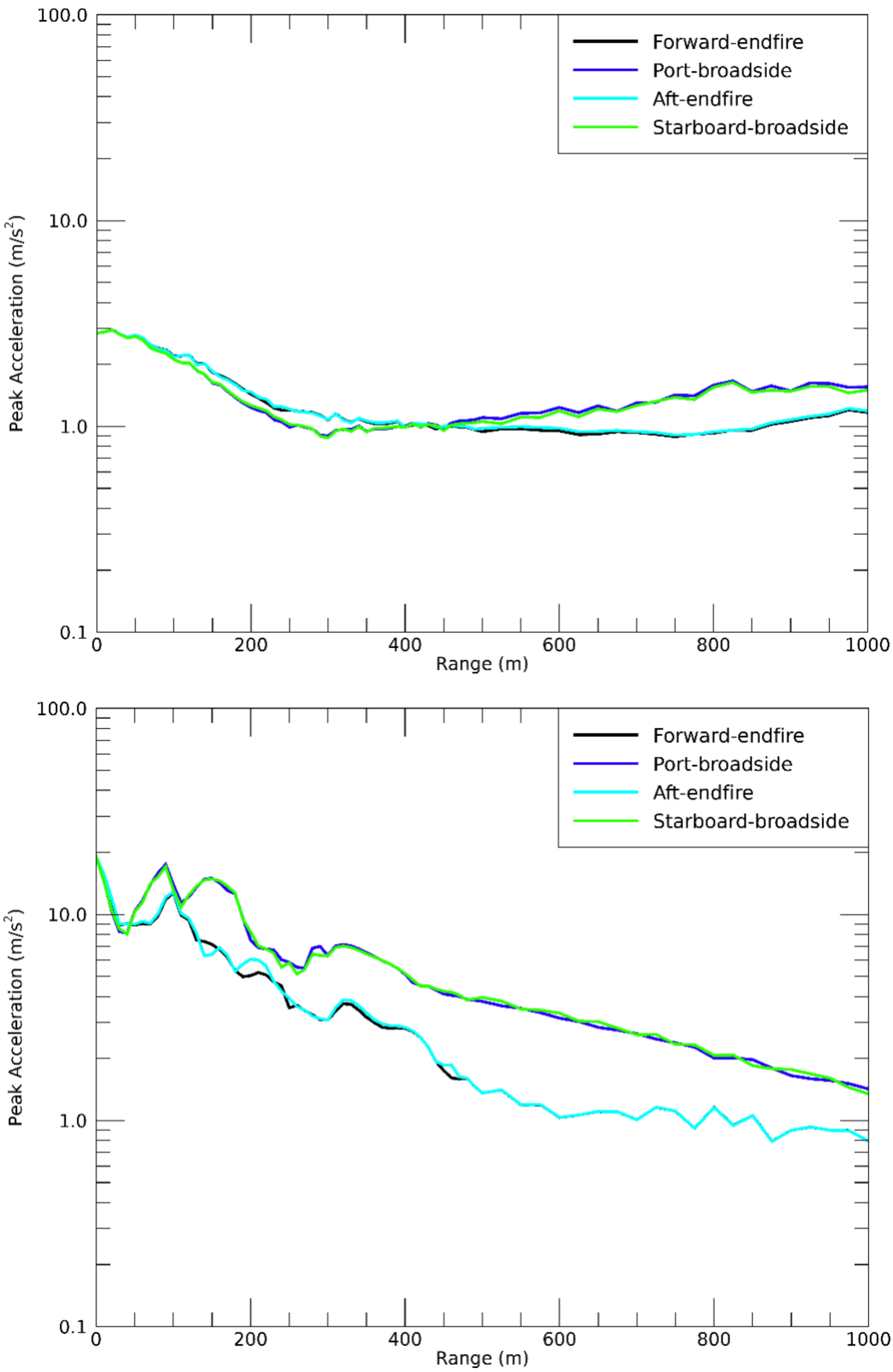


Figure 77 Peak Particle Acceleration at the Seafloor as a Function of Horizontal Range from the Centre of the Acoustic Source along four directions at 1,216 m (top) and 114 m (bottom) Water Depth

7.2.1.2.6 Multiple Source Sound Fields

Sound fields in terms of SEL accumulated over 24-hours of survey within the water column and at the seafloor were determined for the modelled scenarios. Frequency-weighted SEL_{24h} sound fields were used to estimate the maximum horizontal distances (**R_{max}**) to marine mammal and marine turtle PTS and TTS thresholds, and to estimate maximum distance and the area for mortality, injury, and TTS for fish.

The SEL_{24h} sound fields for water column and seafloor are presented as contour maps in Section 5.3 of **Appendix B** and an example of each is presented in **Figure 78**.

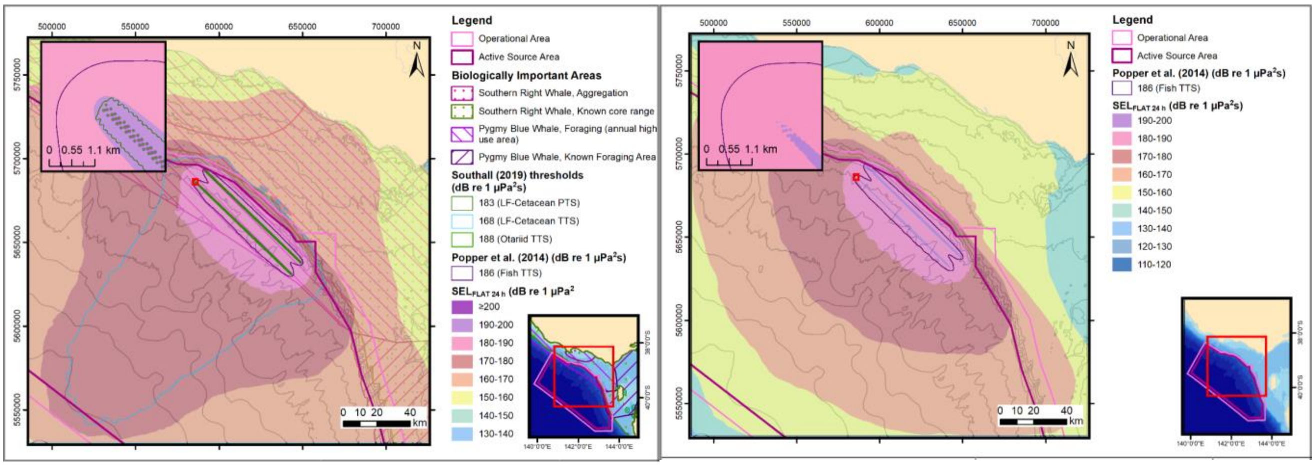


Figure 78 Example Sound Level Contour Maps of Unweighted Maximum-over-depth SEL_{24h} for Area 1: Water Column (left) and Seafloor (right)

7.2.1.2.7 Animal Movement and Exposure Modelling (Animat Modelling)

JASCO's Animal Simulation Model Including Noise Exposure (**JASMINE**) was used to predict the exposure of animats to sound arising from the Otway Basin 3D MC MSS. JASMINE integrates the predicted sound field with biologically meaningful movement rules for each marine mammal species (PBW and SRW in this case) that results in an exposure history for each animat in the model.

Animats are programmed to behave like the marine animals that may be present in an area. The input parameters used for forecasting realistic behaviours (e.g. diving and foraging depth, swim speed, surface times) are determined from marine mammal studies. To evaluate PTS, TTS and behavioural response, exposure results for animats were obtained using the following detailed behavioural information:

- As data on fine-scale foraging behaviour for PBW are not available, data from multi-sensor tags deployed on blue whales off the coast of California were used to inform the feeding behaviours expected in the OA. Data from eight tagged blue whales revealed differences in feeding modes between both shallow and deep feeding and between males and females (Irvine *et al.*, 2019). To account for these differences, female and male pygmy blue whales were modelled separately for the purpose of this EP. Additional data from Goldbogen *et al.* (2011) and Möller *et al.,* (2020) was also used to inform animat behaviour for PBW; and
- For SRWs, separate behavioural profiles were modelled for mother/calf pairs that are expected to spend significantly more time resting at the surface (Cusano *et al.*, 2019; Nielsen *et al.*, 2019) and all other demographics for which migration behaviours were inferred from Double *et al*. (2014), Mackay *et al.* (2020), Baumgartner and Mate (2003), Nousek McGregor (2010), and Dombroski *et al.* (2021).

A depiction of animat movements in a moving sound field is shown in **Figure 79**, with the example animate (red) shown moving with each time step. The acoustic exposure of each animat is determined by where it is in the sound field, and its exposure history is accumulated as the simulation steps through time. For cumulative metrics, an individual animats sound exposure levels are summed over a 24-hour duration to determine its total received energy, and then compared to the relevant threshold criteria.

The sound received by an animat at any given time depends on its location relative to the source. Because the true locations of the animats within the sound fields are unknown, realistic animal movements are simulated using repeated random sampling of various behavioural parameters. Sound exposure distribution estimates were determined by moving large numbers of animats[14] through a modelled time-evolving sound field, computed using specialised sound source and sound propagation models. This approach provides the most realistic prediction of the maximum expected SPL and SEL_{24h} for comparison against the relevant thresholds.

Animat simulations were run for Assessment Area 1 for PBW and SRWs considering four scenarios to predict how exposure levels varied depending on acquisition location relative to the continental shelf. These scenarios and the results generated are discussed in detail in **Section 7.2.2.2.7**.

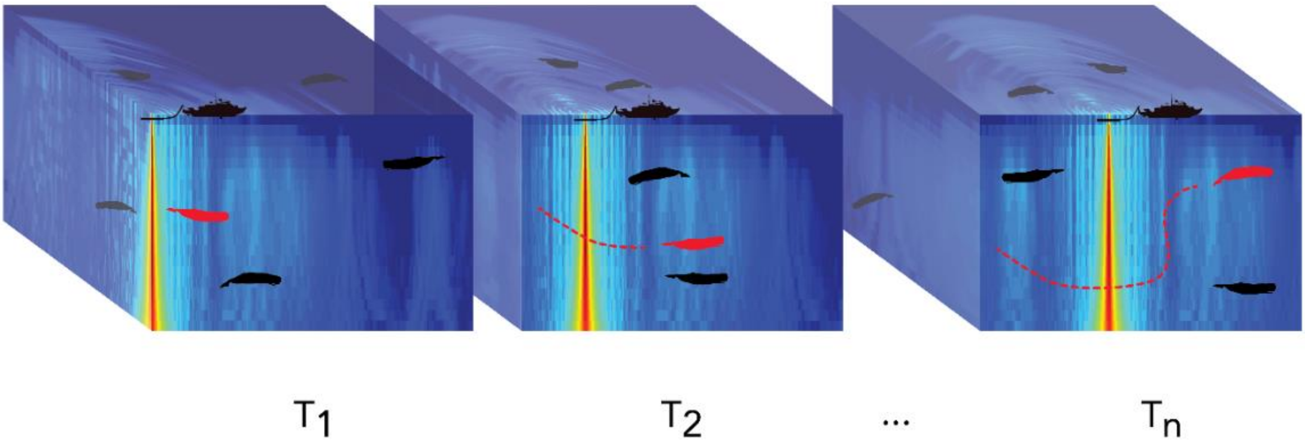


Figure 79 Depiction of Animats in a moving Sound Field

[14] To generate statistically reliable probability density functions, model simulations were run with animat sampling densities of 4 animats/km^2.

7.2.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 63**.

Table 63 Environmental Receptors Assessed

Receptor	Section reference
Plankton	**Section 7.2.2.2**
Benthic Invertebrates	**Section 7.2.2.2.1, Section 7.2.2.3.1**
Fish	**Section 7.2.2.2.3, Section 7.2.2.3.2, Section 7.2.2.4.1**
Cephalopods	**Section 7.2.2.2.5, Section 7.2.2.3.4**
Marine Reptiles	**Section 7.2.2.2.6, Section 7.2.2.3.5**
Marine Mammals	**Section 7.2.2.2.7, Section 7.2.2.3.6, Section 7.2.2.4.2**
Elasmobranchs	**Section 7.2.2.2.4, Section 7.2.2.3.3**
Seabirds	**Section 7.2.2.2.8, Section 7.2.2.3.7**
Australian Marine Parks	**Section 7.2.2.5.1**
Biologically Important Areas	**Section 7.2.2.5.2**
Key Ecological Features	**Section 7.2.2.5.3**

7.2.2.1 Noise Effect Criteria

Noise exposure thresholds are indicative noise levels at which there is potential for certain effects (e.g. mortality, temporary hearing impairment, injury, behavioural changes) to occur to marine receptors. When noise exposure thresholds are published, the response of that particular receptor being exposed to that level of noise is generally defined for a single noise exposure or for cumulative exposure to successive events. For the purpose of this EP, threshold criteria for different fauna have been selected to assist in determining and assessing potential physical, physiological, behavioural and, ultimately, ecological impacts. The threshold criteria adopted for this EP are based on current relevant scientific literature, accepted industry and international standards and are considered to be appropriate for this assessment process.

Generally speaking, a high intensity external stimulus such as an acoustic disturbance will elicit a behavioural response in animals; typically, avoidance or a change in behaviour. The duration and intensity of an animal's observed response is impacted by the nature (continuous or pulsed), source (visual, chemical, or auditory) and the intensity of the stimulus, as well as the individual's species, gender, reproductive status, health and age.

Behavioural responses are instinctive survival mechanisms that serve to protect animals from injury. Consequently, animals may suffer temporary or permanent physiological effects in cases when the acoustic disturbance is too high, or the animal is unable to elicit a sufficient behavioural response (e.g. swim away fast enough).

Depending on the exposure level and sensitivity threshold of each species, the effects of acoustic disturbance can include:

- Physiological effects – changes in hearing thresholds – TTS or PTS damage to sensory organs or traumatic injury; (**Section 7.2.2.2**);
- Behavioural effects (and related impacts) – displacement/avoidance, disruption of feeding, breeding, or nursery activities etc. (**Section 7.2.2.3**);
- Perceptual effects (auditory masking) – interference with communication (**Section 7.2.2.4**) and detection of predators/prey; and
- Indirect effects – behavioural changes in prey species that affects other species higher up in the food chain and could lead to ecosystem level effects (discussed throughout **Section 7.2.2** as relevant, in particular see **Section 7.2.2.3.1**, **7.2.2.3.2, 7.2.2.3.3** and **7.2.2.3.7**).

The following subsections go through each of the different marine receptors that are likely to be present in the OA and a risk assessment is undertaken for those species expected to be exposed to the acoustic disturbance arising from the Otway Basin 3D MC MSS. Threshold criteria for behavioural disturbance, TTS, PTS, and other injuries are discussed in the following subsections, alongside the maximum distance from the acoustic source at which these thresholds were reported to occur.

7.2.2.2 Potential Physiological Impacts

Underwater noise, such as that produced during an MSS, has the ability to cause lethal and non-lethal physiological trauma or injury in marine organisms (Gordon *et al*., 2003).

Of particular concern with regard MSSs and marine organisms is the potential for auditory damage from the acoustic release. Tissue damage to sensory organs from MSS acoustic releases have been experimentally studied in captive/captured fish, cephalopods, and invertebrates, while shifts in hearing thresholds have been experimentally observed in some small pinnipeds and small cetaceans and hypothesised based on observed effects in terrestrial animals. To date there is no direct evidence of damage to the ears of marine mammals from MSS acoustic releases (Gordon *et al*., 2003).

The following provides a discussion on the potential physiological effects of MSSs on marine organisms.

7.2.2.2.1 Plankton

The term 'plankton' describes the drifting organisms that inhabit aquatic environments and includes phytoplankton (plants) and zooplankton (animals), as well as fish and invertebrate eggs and larvae, called ichthyoplankton. There is currently no published information regarding the potential for noise-induced effects on phytoplankton and no functional cause-effect relationship has been established; therefore, impacts from acoustic disturbance on phytoplankton is not considered further.

In comparison to fish and mammals, less research has been conducted on the effects of seismic outputs on zooplankton. This is because zooplankton do not have hearing structures although they can detect changes in pressure (Richardson *et al.,* 2017).

Of the few studies of the effects of seismic sound exposure on plankton, some have found that exposure to emitted sound levels from a seismic survey has no significant adverse effects on the abundance or mortality of zooplankton, such as:

- CarbonNet (2018) assessed zooplankton communities in Australia's Gippsland Basin before and after a seismic survey. Ten sites were sampled during the pre-survey period, consisting of six sites occurring within the survey area and four reference sites. During the post-survey period, three sites were sampled near the survey line, as well as three reference sites. Post-survey sampling occurred within three days of acquiring the last survey line. Copepods, cladocerans and salps dominated the pre-survey samples, whereas the dinoflagellate *Noctiluca scintillans* dominated the post-survey samples. There was a high level of variance among samples and no lobster or scallop larvae occurred in any of the samples. Mortality rates were high in both pre- and post-survey samples and the high proportion of dead cladocerans was contributed to their delicate structure being destroyed by the sampling process rather than attributable to any MSS impacts; and
- Sætre and Ona (1996) examined the mortality rates for fish larvae and fry (taken from Booman *et al*., 1996) for five fish species (cod, saithe, herring, turbot, and plaice) to investigate the consequences that seismic-induced mortality may have at the population level. Under a 'worst-case' scenario, the number of larvae killed during a typical seismic survey (>10 days) was 0.45% of the total larvae population. However, when compared with the high natural mortality rates for each species (e.g. cod and herring eggs/larvae have a natural daily mortality of 5 to 15%) the impacts of seismic surveys on these zooplankton at a population level were considered to be negligible.

In studies where seismic impacts have been observed, many have shown them to be limited to within a range of approximately 10 m from an operating seismic array (Richardson *et al*., 2017), with lost individuals quickly being replaced due to rapid generational turnover rates. For example, Kostyuchenko (1973), Booman *et al*., (1996), and Payne *et al.,* (2009) have reported physiological/pathological effects occurring in zooplankton exposed to an acoustic source up to 5 m away, and mortality occurring when exposed to an acoustic source up to 3 m away. Using a 10 m impact range, McCauley (1994) calculated that plankton mortality would be <1% of plankton in the surveyed area assuming total plankton mortality within this range.

In a more recent real-world study, Day *et al.* (2021) examined the potential impacts of an MSS on the larval stages of southern rock lobster to determine whether early development and recruitment of this species might be affected. This study assessed three aspects, the mortality rates following exposure, impairment of the righting reflex, and the development of exposed lobsters through assessment of progression through the moult cycle. The key results from this study on these three aspects are as follows:

- Exposure did not result in any elevated mortality for puerulus or juveniles;
- Righting was significantly impaired for all exposure treatments immediately after exposure compared to their respective controls which indicated that the impact range extended to at least 500 m from the source, which was the maximum range tested in the study; and
- The results provided evidence of a range threshold for recovery, where juvenile lobsters at a nominal distance of 500 m from the source recovered from impairment after the first moult. Increased intermoult duration suggested impacted development and potentially slowed growth, through the proximate cause was not identified.

In contrast to the studies outlined above, McCauley *et al*. (2017) found that after exposure to a single 150 in^3 acoustic source there was a statistically significant lower abundance of zooplankton, with a median 64% decrease one hour after exposure. McCauley *et al*. (2017) observed impacts out to the maximum 1.2 km range sampled, which was more than two orders of magnitude greater than the previously assumed impact range of 10 m. However, this study was compromised by methodological design (small samples sizes, large daily variability in the baseline and experimental data) and the statistical robustness of the data and conclusions (large number of speculative conclusions that appear inconsistent with the data collected over a two-day period).

Richardson *et al*. (2017), through the CSIRO simulated the large-scale impact of a seismic survey on zooplankton in the Northwest Shelf region of Western Australia, based on the mortality rate associated with seismic noise exposure reported by McCauley *et al.* (2017). The mortality rate associated with seismic exposure reported by McCauley *et al*. (2017) was applied alongside other natural/typical variable values. The hypothetical survey area was 80 km by 36 km in water 300 – 800 m deep and the survey was conducted over 35 days. Overall, the model results showed that zooplankton populations were substantially impacted within the seismic survey area out to a distance of 15 km. Predicted impacts were barely discernible within 150 km of the survey area and there was no apparent effect at a regional scale. The simulation showed that, following exposure, there was a rapid recovery of zooplankton populations due to their fast growth rates and the dispersal and mixing of individuals from inside and outside of the impacted region (Richardson *et al*., 2017). The assessment of these results by the IAGC (2017) review was that even if the full effect claimed by McCauley *et al*. (2017) did in fact exist, zooplankton abundance would not be adversely affected due to the extensive movements of water masses carrying zooplankton through survey areas and the rapid reproductive cycle and high reproductive potential characteristics of planktonic organisms. The IAGC (2017) review concluded that the purported findings of McCauley *et al*. (2017) were of no ecological consequence, given the life history parameters of zooplankton.

In addition to Richardson *et al*. (2017), Fields *et al.* (2019) exposed captive zooplankton (copepods) at a variety of distances from a seismic sound source in order to determine the effect of seismic blasts on *Calanus spp.*, which is a key food source for commercially important fish. The results of this study found that immediate mortality of copepods was significantly different from controls at distances of 5 m or less from the airguns, and mortality one week after the airgun blast was significantly higher (9% relative to controls) in the copepods placed 10 m from the airgun blast, but not significantly different for those 20 m from the airgun blast. The increase in mortality (relative to controls) did not exceed 30% at any distance. Fields *et al.* (2019) concluded that these results suggest that seismic blasts have limited effects on *Calanus sp*. within 10 m of the blast and no measurable impact at greater distances. Fields *et al.* (2019) also commented on the results of McCauley *et al*. (2017), stating that it is difficult to reconcile the high mortality reported by McCauley *et al*. (2017) with the low mortalities reported in the body of earlier research and the results in the experiment that Fields *et al.* (2019) undertook.

Most recently, Vereides *et al.* (2023) also assessed the effects of exposure of seismic sound on copepods (*Acartia tonsa*) focussing on close range exposure ~6 m to air guns in the field. They reported similar findings to Fields *et al.* (2019) in that the exposed copepods exhibited low immediate mortality rates of ~14% *cf.* 4% at the control sites. Delayed mortality was also measured and almost all copepods exposed to seismic sound were dead after six days compared to <50% death in copepods after six days at control sites (it is noteworthy that no feed was added to any treatments post-exposure). Effects on growth and development of copepods was also assessed with exposed copepods exhibiting growth rates approximately 60% lower than for copepods at control sites. Hernes Vereides *et al*. (2023) highlighted that their results were in line with many previous studies on zooplankton and provided further evidence that seismic sound has a limited effect on zooplankton and that when effects occur, they tend to arise within approximately 10 m from the seismic sound source. The authors also made reference to the McCauley *et al*. (2017) finding of an immediate mortality rate of 50% at >1 km stating that this was not replicated within their study which reported an immediate mortality of ~14% at 6 m from sound source.

7.2.2.2.1.1 Plankton UAM

As outlined in **Section 7.2.2.2.1**, there are only a few studies in which threshold criteria for plankton can be based on. Popper *et al.* (2014) cites many of the references and studies on potential impacts of noise emissions on fish eggs and larvae prior to 2014, and results in Day *et al.* (2016) for embryonic lobsters and Fields *et al*. (2019) for copepods align with those presented in Popper *et al.* (2014). These studies conclude that mortality and sub-lethal injury are limited to within tens of metres of acoustic sources. It is also worth noting that the criteria defined by Popper *et al.* (2014) have been extrapolated from simulated pile driving signals which have a more rapid rise time, and greater potential for trauma than pulses from an acoustic source. The results of McCauley *et al*. (2017) indicate the potential for effects at a longer range, and at levels of 178 dB PK-PK; however, as outlined above, Fields *et al.* (2019) noted that it was difficult to reconcile the high mortality reported by McCauley *et al*. (2017) with the low mortalities reported in the greater previous body of earlier research and their own experiment.

Based on the above, the threshold values from Popper *et al.* (2014) have been utilised as part of the UAM report (**Appendix B**) and are summarised within **Table 64**.

Table 64 Noise Exposure Criteria and Zones of Impact for Mortality and Potential Injury for Zooplankton, Fish Eggs and Larvae

Zooplankton, Fish Eggs and Larvae	Mortality and potential injury threshold levels	Maximum threshold distance (m)
Based on Popper *et al.*, (2014) for fish eggs and larvae	PK: >207 dB re 1 µPa	200
	SEL_{24hr}: >210 dB re 1 μPa^2.s	80

7.2.2.2.1.2 Duration and Extent of Zooplankton Exposure

Natural mortality estimates for zooplankton are generally high and variable. Tang *et al*. (2014) reviewed available research and reported zooplankton daily mortality rates of 11.6% (average minimum) to 59.8% (average maximum) but in some instances these authors found that 100% of samples died within a day. Predation accounted for some of this mortality; however, non-predatory factors (e.g. inadequate food resources, physical exposure or poor water quality and diseases/parasites) have been estimated to account for approximately 25% - 33% of the total mortality among marine copepods (Fuiman and Werner, 2002; Tang *et al*., 2014; Dubovskaya *et al*., 2015). In other studies, Houde and Zastrow (1993) estimated the mean mortality rate for fish larvae to be 21.3% per day, and Saetre and Ona (1996) estimated zooplankton mortality to be 5 – 15% per day.

Compared to the high (5 - 59.8%) natural mortality rates reported by the above studies, seismic-related reductions in zooplankton abundance associated with the Otway Basin 3D MC MSS are likely to be very low and cumulative effects of natural mortality and seismic-related mortality are likely to be within the range of natural mortality rates observed in other studies. This assessment is consistent with Richardson *et al*. (2017) who reported seismic impacts on zooplankton will only be discernible locally and are expected to be insignificant at a regional scale given the natural spatial and temporal variability in plankton abundance, and the very high rates of natural mortality.

In addition to the inconsequential seismic mortality rates in comparison to natural mortality rates, it is also important to consider the following points when assessing the predicted impact of the Otway Basin 3D MC MSS on zooplankton:

- The simulation by Richardson *et al*. (2017) showed that, following exposure, there was a rapid recovery (on the scale of days) of zooplankton populations due to their fast growth rates and the dispersal and mixing of individuals from inside and outside of the impacted region. The high energy nature of the offshore marine environment in the OA will help promote rapid recovery of zooplankton populations on account of dispersal, mixing and replenishment by currents from non-impacted areas. Due to the short time required for zooplankton populations to replenish following any reductions in biomass that may occur due to the Otway Basin 3D MC MSS, any effects will be temporary and short-lived and are not expected to have any ecological consequences on zooplankton populations;
- In addition to the findings of Richardson *et al.* (2017) which focussed on population and regional level zooplankton responses, the findings of Day *et al.* (2021) showed that there is a recovery threshold for exposed zooplankton and thus significant potential for recovery in sub-lethally affected zooplankton in proximity to the sound source.
- Due to the magnitude of such localised impacts being negligible (based on **Table 64**), it is not expected that these impacts will be discernible at a regional scale, especially when considering the variability and scale of plankton and spawning biomass in the wider region; and
- Zooplankton occurring within the OA will not be evenly distributed. They will move in accordance with the currents and are likely to exhibit considerable spatial patchiness therefore zooplankton are less likely to be impacted multiple times by a seismic gun.

Overall, there is the potential for localised temporary impacts on zooplankton as a result of the Otway Basin 3D MC MSS; however, population recovery is expected within days after the Otway Basin 3D MC MSS has ceased and no lasting ecosystem population impacts are expected based on the findings detailed above. Based on the scientific literature provided above, the Otway Basin 3D MC MSS will not have any temporal or spatial impacts that are serious or irreversible on any areas that are known to have high productivity within the OA at certain times of the year. In addition, any impacts to local zooplankton populations as a result of the emitted sound levels from the Otway Basin 3D MC MSS will be localised, temporary and recoverable in the short-term.

7.2.2.2.1.3 Scallop Larvae

In 2002, ESSO Australia commissioned a study conducted by the Victorian Marine and Freshwater Institute to address, amongst other things, the concerns of Bass Strait scallop fishermen that seismic activities might increase the mortality of larval scallops (Parry *et al*., 2002). This study tested the effects of seismic surveys on plankton, with special attention to the effects on bivalves (including scallop) larvae. A before-after-control-impact (**BACI**) survey design was used whereby plankton samples were collected before and after (immediately behind and 2 km away from) the transit of the seismic survey vessel (maximum source strength was 211 dB re 1 µPa @ 1 m at a frequency of 50 Hz). The results showed that there was no significant difference between the number of bivalve larvae found in samples collected before and after the seismic vessel had passed. There was also no evidence that seismic exposure caused changes to planktonic taxa in the surface waters (up to 20 m depth) in Bass Strait. It is important to note that the number of bivalve larvae detected was low and therefore only a large impact on their abundance would have been detected (Parry *et al.*, 2002). However, other experimental studies suggest that impacts on plankton are unlikely to occur at distances of more than 10 m from an acoustic source (Parry *et al*., 2002; see **Section 7.2.2.2**).

In another study, New Zealand scallop larvae were experimentally exposed to seismic pulses (160 dB re 1 µPa @ 1 m at 3 second intervals) in order to assess the effect of noise on early larval development (Aguilar de Soto *et al*., 2013). Within one hour of fertilisation scallop larvae were suspended at a depth of 1 m within a tank containing seawater. The effects of noise exposure at 24 to 90 hours of development were investigated and compared to a control group (which experienced no anthropogenic noise). Of the experimental larvae, 46% showed abnormalities in the form of malformations, such as localised bulges in soft tissues. No malformations were observed within the control group. This study provided the first evidence that continual sound exposure causes growth abnormalities in larvae.

Despite indicating larval vulnerability, it is important to put the results of the Aguilar de Soto *et al*. (2013) study into context. The experimental study was restricted to newly fertilised larvae that were exposed to sound pulses of 1.5 seconds duration every three seconds (over a period of 24 – 90 hours). In contrast, the Otway Basin 3DMC MSS will have a shot-point interval of 5.4 seconds and exposure time will be much shorter since the source is constantly moving and will pass most acquisition lines only once. This study used pulse duration of 1.5 seconds whereas the pulse duration for a seismic array is typically around 30 milliseconds.

Field-based studies carried out by Pearson *et al*. (1994) and Parry *et al*. (2002) have reported no evidence of delayed development, increased mortality, or reduced abundance in bivalve or decapod larvae when exposed to more realistic noise impulse scenarios.

The most proximal scallop fishery to the OA is the Bass Strait scallop fishery, which has a 3,000 tonne catch limit, and is located approximately 285 km to the east. Although this fishery is a reasonable distance away from the proposed activity, during consultation, it has been reported that the spawn that feed this fishery come from VIC/South Australia waters. Scallops reproduce via broadcast spawning, whereby individuals release sperm first followed by eggs (Minchin, 2022). Once external fertilization has occurred, the larvae stay in the water column for 30 days (Ovenden *et al*., 2016) before settling, assuming the sediment is suitable for their recruitment. Spawning for the Australian commercial scallop (*Pecten fumatus*) occurs in winter/spring (June to November) (Dredge *et al*., 2016; Sause *et al*., 1987) and peak settlement of larvae occurs in mid-late September (Hortle and Cropp, 1987). There is some very limited evidence for a smaller, autumn peak in spawning for scallop populations in Bass Strait (Coleman, 1988). The timing of spawning (winter/spring), and the timing of the proposed survey (most likely October to March) is at the end of the peak spawning season (September) and towards the end of the peak larval settlement period (mid-late September). So, with the 30-day period that the scallop larvae remain in the water column and the commencement of the Otway Basin 3D MC MSS, it is likely that most of the scallop larvae will have settled to the seabed, mostly in the coastal waters, inshore of the OA. As such, and in accordance with Day *et al*. (2016a) and the zooplankton discussions in **Section 7.2.2.2.1,** the residual risk to scallop larvae arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Possible*).

7.2.2.2.1.4 Rock Lobster Larvae

Due to the logistical and financial difficulties of field-based experiments, most scientific investigations into the impact of seismic outputs on rock lobster (and other marine invertebrate) larvae have been confined to laboratory environments. While these laboratory experiment cannot exactly replicate real-world conditions, they still provide useful information on test species response to seismic sound sources. Field based studies are more likely to be representative of the real-world impacts of MSS. In relation to rock lobster larvae there are some recent field experiments that have provided useful information on the real-world impacts of seismic sound sources.

As already summarised in **Section 7.2.2.2.1**, Day *et al.,* (2021) tested the effects of a commercial MSS on southern rock lobster (*Jasus edwardsii*) larvae (puerulus) and post-larval juveniles at a site off Lakes Entrance, VIC. Puerulus were randomly assigned to either Control (not exposed to air gun signals) or E0 (exposed to air gun signals at a nominal range of 0 m from the vessel sail line) treatments. Juveniles were assigned as above for Puerulus but also to a E500 treatment (exposed to airguns at nominal range of 500 m). All treatments lay at between approximately 50 m and 60 m depth. The seismic vessel towed three 2,820 in^3 seismic sources at 8 m depth, one 435 m astern the vessel on the vessel sail line and one 100 m either side of this source. Behind the air gun array sources, 12 x 7.3 km long seismic streamers were towed spaced across 1.3 km, which carried the hydrophones that recorded the seismic signals. Each seismic source was operated alternatively at a median 5 s rate (mean 5.3 s).

Once the MSS was completed lobsters were recovered and tested for dorsoventral righting reflex which is a complex reflex requiring sensory input to mediate neuromuscular coordination and is tested by quantifying the time taken to return to a dorsum-up position after being placed in a ventral side up position. A subsample of rock lobsters was returned to the laboratory and held until they had moulted twice (juveniles) or three times (puerulus) to calculate intermoult duration for each lobster. The moulting process is physiologically stressful and can be delayed in due to external stressors, thus making intermoult duration an important measurement of physiological condition as well as a marker of growth and development (Day *et al.,* 2017).

Day *et al.,* (2021) found that exposure to a SEL of 227 - 229 re 1µPa^2.s:

- Did not result in any elevated mortality for either puerulus or juveniles;
- Caused significant impairment of righting reflex for all treatments;
- After one moult the effects on righting reflex were largely undetectable for the more distant 500 m treatment, indicating that recovery is possible for sub-lethally exposed individuals at distances greater than 0 m from the sound source; and
- Intermoult time periods increased significantly for the 0 m treatment for puerulus (and observationally for juveniles, though abundances were too small for statistical analyses) indicating potential effects on development and growth but the authors state that that exposure to the sound source was not a definitive cause of this observation.

The specification of the seismic survey carried out in Day *et al.,* (2017) is not dissimilar to that proposed here. Both are triple source with the proposed air guns being 3,480 in^3 (*cf.* 2,820 in^3: Day *et al*., 2017). The proposed seismic sources will be towed at 8 m depth (*cf.* 7m: Day *et al.,* 2017). Behind the air gun array sources, up to 14 7.3 km long seismic streamers will be towed (*cf.* 12 x 7.3 km long seismic streamers spaced across 1.3 km: Day *et al*., 2017), which will carry the hydrophones that recorded the seismic signals. Each seismic source will be operated alternatively at a median 5.4 s rate (*cf* 5.3 s: Day *et al.,* 2017). The similarity in MSS specifications and relative geographic proximity of the proposed Otway Basin 3D MC MSS and Day *et al.* (2017) study mean that the results outlined here are highly relevant. These results broadly align with the bulk of pre-existing literature on the near-field effects of seismic sound exposure to zooplankton further demonstrating that effects of seismic exposure on rock lobster larvae are largely sub-lethal, temporary and localised, occurring in areas proximal to the sound source.

In 2016, Day *et al.* published an in-situ study (Day *et al*., 2016a,b) on the impact of seismic source exposure on the embryonic development of southern rock lobster (*Jasus edwardsii*) larvae. This experiment was conducted in Storm Bay in Southern TAS, over a shallow limestone reef platform with uniform depths of 10 – 12 m. Here, egg-bearing female rock lobsters were exposed to signals from three seismic source configurations at various distances (45 in^3 airgun and 150 in^3 air gun high pressure experiments, and a 150 in^3 low pressure experiment), all of which exceeded SELs of 185 dB re 1 µPa^2·s. The maximum and median cumulative SELs estimated in the three experimental regimes were 192 and 191 for the 45 in^3 experiment, 193 and 192 for the 150 in^3 low pressure experiment and 199 and 197 dB re 1 µPa^2·s for the 150 in^3 high pressure experiment.

Specifically, berried female rock lobsters were randomly allocated into control and exposed treatments and placed in situ in lobster pots. Seismic source runs were made starting at 1 – 1.5 km from the line of pots with the source run towards and over the pots, with total air gun exposures of 24.3, 17.2 and 23.3 minutes, for 126, 112 and 110 shots for the 45 in^3, 150 in^3 low pressure and 150 in^3 high pressure experiments. Control runs emulated the exposure runs with the source deployed and pressurised but not operated. Following the control and exposure runs, the lobster pots were recovered, and the rock lobsters were kept in holding tanks until hatching, which occurred a mean 87±2, 79±2 and 79±3 days post-exposure in the 45 in^3, 150 in^3 low pressure and 150 in^3 high pressure experiments, respectively.

Once hatched, the effects of the exposure treatments on rock lobster embryonic development were assessed by examining the number, morphology, energy content and competency of hatched larvae.

The results showed that:

- There were no mortalities of the adult berried female lobsters in either control or exposed treatments for any of the three experiments;
- All females had successful hatches with no incidence of loss or removal of the egg bundle;
- Lobsters in both treatments over all three experiments hatched over the course of a 5 – 6-day period, with a peak in the number of larvae hatched around days 3 – 4;
- There were no morphological abnormalities in any of the hatches;
- There were some differences in larval body length between control and exposed larvae in the 45 in^3 experiment (exposed larvae were approximately 1.5% longer than control larvae), but not in the other two experiments;
- There were no differences in larval width between treatments for all three experiments;
- There were no differences in length-to-weight and width-to-weight ratios between treatments for all three experiments;
- There were no significant differences between the dry masses of any of the treatments;
- Larval energy content did not differ between treatments in any of the exposure levels; and
- There was no difference in larval competency (i.e. activity test results) between treatments in any of the exposure levels.

The results dismiss concerns that exposure to seismic signals will result in egg bundle loss, decreased fecundity, comprised larvae and/or morphological abnormalities. The concern that exposure will result in abnormal larval morphology, cannot be immediately dismissed, as the exposed larvae from the 45 in^3 experiment were found to be significantly longer than control larvae. However, the larval size falls within the range for Stage I larval length of *J. edwardsii* (Lesser, 1978) so it is likely that the observed length difference is not biologically significant.

Overall, the results of the Day *et al.* (2016a, 2016b) study found no differences in the quantity or quality of hatched rock lobster larvae and these authors concluded that seismic air gun exposure during early-stage embryonic development does not negatively affect rock lobster larvae. However, other life stages were not investigated in this study so concern over the potential effects of seismic outputs on other life stages cannot be dismissed.

The UAM study (Welch *et al.,* 2023) has shown that threshold for cumulative exposure (SEL_{24h}: 210 dB re 1 µPa^2·s) for fish eggs and larvae (a component of zooplankton) will not be reached at the seabed in the area where 3D MSS will be taking place. This means that on the seabed in the majority of the AA any berried female rock lobsters, their eggs and resulting larvae are extremely unlikely to be affected by the Otway Basin 3D MC MSS.

2D acquisition will be carried out in a very small relatively shallow (94 m – 500 m) proportion of the AA (73 km^2, or 0.16% of the AA). The UAM did not assess the potential for cumulative exposure thresholds to be reached at the seabed in this area. It is possible that in shallower parts of the 2D MSS area the cumulative threshold (SEL_{24h}: 210 dB re 1 µPa^2·s) could be reached at the seabed. If cumulative exposure thresholds were reached within the 2D AA it is possible that berried females, eggs and subsequent larvae could be affected. In addition, the results of the Day *et al.* (2021) study have shown that while effects on proximal rock lobster larvae and juveniles are likely (if they are present) they will be sub-lethal, temporary (either based on an individual's ability to recover, or based on the population recovery time of zooplankton more generally (Richardson *et al.,* 2017)) and restricted to within a localised area around the sound source.

Based on the results of Day *et al.* (2016 and 2021) the residual risk to rock lobster larvae arising from acoustic disturbance during the Otway Basin 3DMC MSS has been assessed as **Low** (*Minor* x *Likely*).

7.2.2.2.1.5 Overall Ecological Impacts of Plankton Exposure

Zooplankton are an important food source to many fish species and cetaceans in the ocean, and any significant reductions in zooplankton biomass has the potential to affect the wider food chain due to cascading effects. This is particularly important to consider in sensitive areas like those associated with the West Tasmania Canyons KEF and BIAs, which overlap with the OA (**Section 4.4.3**).

Ecological effects of reduced zooplankton biomass may include changes in the distribution of species which rely on zooplankton as a food source, such as pelagic fish, seabirds, and some marine mammals, where they temporarily have to relocate to another foraging ground to find the food they require for survival.

For example, distributional changes in zooplankton (particularly krill) flow could have effects on taxa that prey on plankton or are reliant on lower food chain predators of zooplankton as a prey source. Catch rates of commercially fished species could also conceivably change in response to flow-on effects associated with changes in the abundance or distribution of zooplankton prey.

Based on the extensive literature reviews, the weight of the scientific literature supports that any potential flow-on effects to marine food webs through impacts on zooplankton are expected to be spatially restricted. For the Otway Basin 3D MC MSS, the UAM (**Table 64**; **Appendix B**) predicts the zone of impact for zooplankton to extend 140 m from the seismic source for fish eggs and larvae (based on Popper *et al*., (2014)). Based on the results of the Day *et al.* (2021) some temporary, sublethal effects could occur for certain components of zooplankton at up to 500 m from the acoustic source. Baseline conditions can be expected to resume relatively quickly after survey completion (see Richardson *et al*., 2017) due to replenishment of zooplankton back into the area.

There are unlikely to be any wider ecosystem-related impacts as a result of cumulative natural and seismic-related mortality effects. Even after they die, zooplankton remain available as a food source for higher organisms as their carcasses remain in the water column for several days. If they are not consumed, they then fall to the seafloor and where they are available as a food source for benthic organisms (Kirillin *et al*. 2012; Tang *et al*. 2014).

Overall, the residual risk to zooplankton physiology on a population level arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible* x *Likely*).

7.2.2.2.2 Benthic Invertebrates

Research into the relationship between sound and its effect on benthic invertebrates is ongoing, including the relevant metrics for both effect and impact. Available literature suggests marine benthic invertebrates are most sensitive to the vibrational component of sound, owing to a lack of anatomical structures involved in detecting the pressure component of sound. Like elasmobranchs, marine invertebrates lack a gas-filled bladder and are thus unable to 'hear' the pressure changes associated with sound waves. Instead, marine invertebrates detect sound by sensing the particle motion component of sound in water and within seabed sediments through physiological structures such as statocysts, sensory hairs and muscles (Carroll *et al*., 2017). McCauley (1994) reported that for many benthic species, these receptors will perceive seismic acoustic outputs, but this will only occur within a few metres from the sound source.

Marine invertebrates can be free-living or sessile, are often localised to particular benthic microhabitats, and generally have lower mobility than pelagic species. Hence, they generally have a reduced ability to avoid acoustic emissions, and any potential associated impacts, by moving away. Studies investigating the physical and physiological impacts of seismic noise on marine invertebrates are relatively limited (Carroll *et al*., 2017). Where such studies exist, the acoustic signature and exposure scenarios applied are often not comparable to those of a typical (i.e. commercial) seismic survey. The findings of such studies are also highly variable and, in some cases, disparate. For example, exposure to noise has resulted in a few reports of immediate (Lagardère, 1982; McCauley *et al*., 2017; Fields *et al.,* 2019) or delayed mortality (Day *et al*., 2017). In addition to mortality effects, a range of physiological impacts have also been observed including damage to sensory systems (Day *et al*., 2019; Day *et al*., 2022), disruption to immune system function (Fitzgibbon *et al*., 2017), stress biochemistry (Payne *et al.*, 2008; Day *et al*., 2021) and changes to metabolic rate. Conversely, several studies have reported no significant effects (Przelawki *et al*., 2018; Day *et al.*, 2016). In summary, the available literature does not clearly define an appropriate metric or identify relevant levels (pressure or particle motion) for assessment. Despite this, current industry practices for investigation and determining impacts and risk associated with acoustic emissions for marine invertebrates have been determined based on pressure levels presented in the literature for three taxonomic groups including crustaceans, bivalves and sponges and corals.

Of particular relevance to the Otway Basin 3D MC MSS are impacts to decapods (crabs and shrimp), octocorals and sponges which inhabit the soft sediment and hard substrate, respectively, that comprise the OA (see **Section 4.5.2**). Whilst polychaete worms were identified as the most predominant invertebrate taxa within soft sediment habitats comprising license area AC/RL7 (ERM, 2012; O2 Marine, 2018), located in the western portion of the OA, the effects of seismic exposures on these organisms have not been studied. Hence, the precautionary principle applies, and it's assumed that polychaetes could experience worst-case effects analogous to those reported for other benthic invertebrate taxa.

Crustaceans

Crustaceans are the most studied marine invertebrate group with respect to impacts associated with low-frequency acoustic disturbance, such as that generated by seismic airguns (Carroll *et al.,* 2017), owing in-part to their economic value. Hence, studies are largely constrained to investigations of physical, behavioural, and physiological effects and their implication upon catch rates of commercially important decapod crustaceans (lobsters, prawns, crabs) (Edmonds *et al*., 2016). Experiments on lobsters indicate that the main vibration receptors are in the statocyst and the walking legs (Day *et al.,* 2019; Aicher *et al*., 1983). The statocyst controls the righting reflex in lobsters, the coordination of which plays a vital role in predator evasion.

The reported impacts of seismic exposure on crustaceans are highly variable, though none have found any evidence of increased mortality of adults or life history stages and no direct impacts to the survivorship of exposed larvae have been reported (Carroll *et al.,* 2017; Day *et al*., 2016; Day *et al*., 2022). Likewise, studies investigating the influence of seismic exposure on commercially important species (e.g., snow crab and southern red lobster) do not appear to support the anecdotal contention that MSSs negatively affect catch rates in the short or long term (Morris *et al*., 2018; Parry and Gason, 2006).

As described in **Section 7.2.2.2.1**, current literature does not clearly define an appropriate metric or identify relevant effects levels for noise assessments. Adopted industry practice effects levels for crustaceans associated with no effects and sub-lethal effects attributable to seismic emissions have been derived based on exposure of a limited number of species to a range of seismic signals of variable representativeness when compared to a commercial MSS. A summary of relevant studies and findings upon which the adopted industry practice effects levels have been derived are provided below.

Payne *et al*. (2008) conducted a pilot study on the effects of seismic sound exposure on various health indicators on American lobster. Adult lobsters were exposed to an acoustic source for 20 or 200 pulses at an average pressure of 202 dB re 1 µPa PK-PK or 50 pulses to 227 dB re 1 µPa PK-PK. Study subjects were located 2 m from the acoustic source. The study investigated potential changes to survival, food consumption, turnover rate, and serum biochemistry. No immediate or delayed mortality was observed, nor damage to mechano-sensory systems and the ability of lobsters to right themselves when turned over. However, there was evidence of a decrease in serum enzymes and increases in food consumption in the weeks to months post exposure, interpreted to indicate potential stress effects or osmo-regulatory disturbance. Whilst no impacts to long-term survival and population ecology were observed, the results indicate the potential for sub-lethal effects. On this basis, a PK-PK sound level of 202 dB re 1 µPa is broadly considered to be associated with no effect and therefore applied in the assessment.

To further understand the interactions between MSS and marine invertebrates, Day *et al*. (2016a, 2016b) investigated the effects of low frequency acoustic signals on adult rock lobsters, including egg carrying females. The study involved exposure of southern rock lobster to (up to four) passes of an active acoustic source, whilst placed in field sites consisting of comparable seabed morphology to the natural habitat of the subject species[15]. The study found that adult southern rock lobsters (*Jasus Edwardsii*) which were exposed to seismic sound levels up to a maximum of 212 dB re 1 µPa PK-PK did not show an increase in mortality and no lethal effects to embryos were observed. Evidence of sub-lethal effects in adult, exposed, lobsters included impairment of reflexes involved with tail control and righting, damage to the sensory hairs of the statocysts (balance organ), a reduction in the number of haemocytes (indicative of reduced immune response function). Though the study reported some improvement to condition and righting reflexes across the monitoring period (120 days post-exposure), the effects to the statocysts appeared somewhat persistent being observable at 365 days post-exposure and post-moult. There was no reported difference in fecundity between the control and exposed lobsters. Likewise, hatched larvae were found to be unaffected. There was no reported difference in the number and condition of hatched larvae between the control and exposed lobsters, suggesting that exposure during early embryonic stage did not impair embryo development.

Uniquely, the study found that control subjects collected from Crayfish Point Reserve, a site which experiences substantial levels of anthropogenic noise, showed a level of statocyst damage equivalent to that of seismic exposed treatments, including 'noise-naïve' subjects. Further, exposure to air gun treatments did not result in additional statocyst damage in the exposed treatment relative to the controls and there were no significant differences in righting time in these lobsters. The author concluded that the damage observed was pre-existing and not exacerbated by seismic exposure as a result of the experiment. Coupled with subsequent comparisons of the soundscape at each site, Day *et al*. (2022) contends that lobsters at Crayfish Point Reserve demonstrated an ability to cope with or adapt to mechanosensory damage arising from noise exposure. Long-term monitoring of lobsters at Crayfish Point Reserve suggests the population has reached carrying capacity (Kordjazi *et al.,* 2015), indicating the observed mechanosensory damage has not resulted in negative ecological impacts. Instead, the population is perceived to be thriving. Day *et al*. (2019) further examined the impacts of MSSs on the physiology of southern rock lobster species. Exposure experiments were carried out at the seabed, in a field setting selected to emulate the natural habitat (seabed type and water depth) of the study species. The study found that adult southern rock lobsters (*Jasus Edwardsii*) which were exposed to seismic sound levels up to a maximum of 209 - 212 dB re 1 µPa PK-PK did not show an increase in mortality, even at close proximities to the sound source. However, there was evidence of sub-lethal effects occurring following seismic sound exposure; specifically, impairment of reflexes involved with tail control and righting, damage to the sensory hairs of the statocysts, and a reduction in numbers of haemocytes. Reflex impairment and statocyst damage persisted up to 365 days post-exposure and did not improve following moulting. Ecological impacts were not evaluated as part of the study.

Life-history stage is a critical factor for considering impacts upon broadcast spawning marine invertebrates which rely on the production of many offspring to maintain recruitment of adult populations and these potential impacts have been covered in Section **7.2.2.2.1**.

[15] Of note, is that field sites were very shallow (10 to 12 m) and are not considered representative of a typical environment in which MSS would be undertaken.

Though marine invertebrates are most sensitive to the vibrational component of sound, rather than sound pressure, it is not clear what level of particle motion relates to an adverse effect. Therefore, where available, sound level thresholds have been used to inform the UAM (Welch *et al*., 2023). Whilst no published threshold criteria currently exist to enable an evaluation of potential mortality or lethal injury effects on crustaceans, a PK-PK sound level of 202 dB re 1 µPa (per pulse) from (Payne *et al*., 2008) is considered to be associated with no effect and therefore adopted for the purpose of the assessment. Results were also compared against PK-PK sound levels ranging from 209 -213 dB re 1 µPa PK-PK determined by Day *et al.* (2016a, b) and Day *et al*. (2019) to result in potential sub-lethal effects (see **Appendix B**).

Bivalves

As is the case for crustaceans, studies undertaken on bivalves are largely constrained to commercially important taxa such as scallops and oysters. Recent Australian studies have focussed on southern scallops, *Pecten fumatus*, and found no evidence of immediate mortality or change in condition following exposure to seismic disturbance. However, sub-lethal effects to scallops were observed, including a compromised capacity for homeostasis and potential immunodeficiency over acute (hours to days) and chronic (months) timescales following exposure (Day *et al*., 2016b; 2017).

Day *et al*. (2016b; 2017) concluded that repeated exposure to seismic disturbance resulted in physiological damage, changes in behaviour and reflexes and increased risk of mortality, though not beyond naturally occurring rates of mortality. Injured scallops did not recover over the four-month period of the experiment. The authors reported that, compared with unexposed scallops, the daily mortality odds were found to be 0.1%, 1.2%, and 1.3% higher in scallops exposed to 1, 2 and 4 acoustic passes, respectively. Though the size of the air gun appeared to have no effect (Day *et al*., 2017). Uniquely, Day *et al*. (2017) measured the response of *Pecten fumatus* to ground roll acceleration associated with different experimental regimes as a proxy for particle acceleration. As particle motion is the more relevant metric to invertebrate sensory systems, the study provides novel insight into bivalve response to seismic disturbance.

In contrast, a study conducted by Przeslawski *et al*. (2018) found no evidence of increased scallop mortality, or effects on scallop shell size, adductor muscle diameter, gonad size, or gonad stage attributable to exposure to seismic disturbance. However, this study did not examine any long-term sub-lethal effects.

No published threshold criteria currently exist to enable an evaluation of potential mortality or lethal injury effects on bivalves. Likewise, the literature does not present a sound level associated with no impact. Consequently, the maximum measured particle acceleration reported within Day *et al*. (2017) of 37.57 ms^{-2} has been adopted to represent the level of acoustic disturbance known to elicit reduction in physiological condition for the purpose of this assessment.

Sponges and Corals

There is limited published literature on the potential impacts of seismic noise on hard and soft corals and sponges. Unlike other faunal groups such as cetaceans, currently there is no peer-reviewed criteria against which potential noise impacts to corals and sponges can be assessed.

The primary forms of physiological damage of corals due to exposure to high amplitude sound are understood to be: (1) breaking of the coral skeleton that could also damage the polyp tissue, and (2) rupture or tearing of polyp tissues (Hastings, 2008). The forces required to cause such damage were predicted by Hastings (2008) to be in excess of 260 dB re 1 µPa PK-PK.

Battershill *et al*. (2008) and Heyward *et al*. (2018) investigated the effects of the Woodside Maxima 3D MSS on hard corals in water depths of approximately 40 – 60 m within south Scott Reef lagoon. Corals received maximum sound pressure levels of 226 dB re 1µPa PK. No mortality, damage to soft tissue or skeletal integrity, visible signs of stress, change in abundance or community structure was detected immediately after, and up to four months following exposure. Soft corals were also examined, with particular notice taken of soft coral morphology and polyp extension immediately after seismic passes. No change on soft coral abundance was detected and there was no evidence of a behavioural response, such as polyp withdrawal or flaccidity (Battershill *et al*., 2008; Heyward *et al*., 2018).

Heyward *et al*. (2018) monitored the condition of Scleractinia corals at South Scott Reef, within the North West Marine Region, before and after a 3D MSS which involved a maximum peak sound level of 226 dB (i.e., 226 dB re 1 µPa PK) at the coral monitoring sites. There were no observable impacts to coral mortality, skeletal damage or visible signs of stress immediately after and up to four months following the acoustic disturbance event. Similarly, there was no evidence of a behavioural response, such as polyp withdrawal or flaccidity in the soft corals assessed. While not included as a test taxa in Heyward *et al.* (2018), for the purposes of this assessment of effects, sponges are considered together with soft corals because they are similar in that both have a similar density to water and do not have solid skeletal structures that could be damaged by pressure changes as a result of high-amplitude noise.

In lieu of published threshold criteria in Heyward *et al*. (2018), a PK sound level of 226 dB re 1 µPa (per pulse) is adopted for the purpose of the assessment in the UAM (Welch *et al.,* 2023). Importantly, this is not a threshold above which impacts are expected to occur, but a level at which no short term or long-term effects were observed.

7.2.2.2.2.1 Benthic Invertebrate UAM

As outlined in **Section 7.2.2.2.1**, there are few studies upon which threshold criteria for benthic invertebrates can be suitably developed. Based on the above, the threshold values used to inform the UAM report (**Appendix B**) and corresponding threshold distances are described in **Table 65**.

Table 65 Noise Exposure Criteria and Zones of Impact for Mortality and Potential Injury for Crustaceans, Bivalves and No Effect Threshold for Corals/Sponges

Benthic Invertebrates	Potential sub-lethal effects threshold levels	Maximum threshold distance (m)
Based on Day *et al*. (2019) and Day *et al*. (2016) for crustaceans	PK-PK: 209 - 212 dB re 1 µPa	421
Based on Day *et al.* (2017) for bivalves	37.75 ms^{-2}	10.5
	No effect threshold level	**Maximum threshold distance (m)**
Based on Payne *et al*. (2008) for crustaceans	PK-PK: >202 dB re 1 µPa	778
Based on Heyward *et al.* (2018) for corals and sponges	PK: >226 dB re 1 µPa	11

The results of the UAM indicate that where 3D MSS activity occurs in the AA:

- The adopted criteria of 202 dB re 1 µPa PK-PK for crustaceans, which is a minimum level that is representative of no effects, was not detected at horizontal distances greater than 489 m (at 674 m depth) and 512 m (at 569 m depth) from the 3,480 in^3 source;
- The adopted criteria of 209 - 213 dB re 1 µPa PK-PK for crustaceans, which is representative of possible sub-lethal effects for crustaceans, was not detected at horizontal distances greater than 105 m (at 674 m depth) and 157 m (at 569 m depth) from the 3,480 in^3 source;

- The adopted criteria for particle motion of 37.57 ms^{-2}, the threshold for potential reduction in physiological condition for bivalves, was not detected at any distance from the 3,480 in³ source acoustic source for the modelled scenarios; and
- The adopted criteria of 226 dB re 1 µPa PK, which is the threshold for no effects for sponges and coral, was not detected at any distance from the 3,480 in³ acoustic source.

The results of the UAM also indicated that where only 2D seismic survey activities occur in the AA:

- The adopted criteria of 202 dB re 1 µPa PK-PK for crustaceans, which is a minimum level that is representative of no effects, was not detected at horizontal distances greater than 676 m (at 220 m depth) from the 3,480 in³ source;
- The adopted criteria of 209 - 213 dB re 1 µPa PK-PK for crustaceans, which is representative of possible sub-lethal effects for crustaceans, was not detected at horizontal distances greater than 238 m (at 220 m depth) from the 3,480 in³ source;
- The adopted criteria of 226 dB re 1 µPa PK, which is the threshold for no effects for sponges and coral, was not detected at any distance from the 3,480 in³ acoustic source.

7.2.2.2.2.2 Sub-lethal Effects and Potential Effects

Given the importance of proximity to the acoustic source in determining potential effects, the depth of the AA is a critical consideration regarding the potential effects of seismic activities on benthic invertebrates. The proportion of the AA in which 3D MSS activities occur is 500 m deep at its shallowest point, with >99% of AA area lying at depths greater than 700 m depth. 2D MSS activities only will be carried out in a small (73 km^2 or 0.16%) shallow proportion of the AA.

The thresholds provided in **Table 65** are a guide to potential distance-based effects thresholds for high amplitude noise for four broad taxon groups from existing literature. As set out above, the thresholds in **Table 65** were compared to the UAM outputs. The following points cover effects of 3D MSS activities based on the consideration of UAM outputs and adopted effects thresholds in the context of seabed depths within the AA:

- The no-effect criteria for crustaceans of 202 dB re 1 µPa PK-PK, was modelled as being detectable at no greater than 512 m from the acoustic source. Given that this threshold represents no observed effects, any crustaceans inhabiting seabed areas at between 512 m and 500 m are considered to exist in areas that are on the outer margins of potential for sub-lethal effects. The area of the AA that lies at between 500 and 520 m is 2.5 km^2 which is 0.0005% of the total AA;
- The sublethal-effect criteria of 209 - 213 dB re 1 µPa PK-PK for crustaceans was modelled as being detectable at no greater than 157 m from the acoustic source. Given that the seabed is no shallower than 500 m in areas where 3D seismic activities will occur, this level of sub-lethal effects is highly unlikely to occur;
- No sub-lethal to fatal effects on molluscs were predicted to occur;
- No effects on corals and sponges were predicted to occur; and
- Given the response of organisms such as polychaete worms to seismic exposure have not been studied, and therefore the precautionary principle applies, it’s considered polychaetes could experience a range of sub-lethal effects.

Although only relevant to a very small proportion, approximately 73 km^2, or 0.16%, of the AA, the following points cover effects of 2D MSS activities based on the consideration of UAM outputs and adopted effects thresholds in the context of seabed depths within the relevant part of the AA:

- The no-effect criteria of 202 dB re 1 µPa PK-PK for crustaceans, was modelled as being detectable at no greater than 676 m from the acoustic source. Although this is a no-effects threshold, given the shallow depths in this area, crustaceans on the seabed have the potential to be being sub-lethally affected. This result should be considered alongside the predicted maximum distance for observed sublethal effects below;
- The sublethal effect criteria of 209 - 213 dB re 1 µPa PK-PK for crustaceans, was modelled as being detectable at no greater than 238 m (at 220 m depth) from the acoustic source. Given that this is an observed effect threshold, crustaceans on the seabed in areas shallower than 238 m are considered to be more likely to be sub-lethally affected than crustacea in deeper areas of the AA. Approximately 40 km^2 or 0.087% of the AA lies within this area of observed effects for crustaceans;
- No effects on corals and sponges were predicted to occur;
- Sub-lethal to fatal effects on molluscs were not predicted to occur; and
- Given the response of organisms such as polychaete worms to seismic exposure have not been studied, and therefore the precautionary principle applies, it's considered polychaetes could experience a range of sub-lethal effects.

The reported zones of potential impact for benthic invertebrates within the OA represent a considerably small portion of the available benthic habitat which is comprised mostly of soft sloping continental shelf edge sediments. There is no evidence that any significant reef structures or other seabed features which could host hotspots of benthic invertebrate diversity fall within any of the zone of potential impact (the area shallower than 512 m).

Despite the potential vulnerability to seismic emissions of benthic invertebrates due to their limited mobility, the studies that produced the effects threshold criteria adopted here concluded that mortality rates observed during exposure to seismic sound were within the natural range of variation which may be expected to occur due to changes in environmental conditions and anthropogenic stressors (Day *et al*., 2017; Payne *et al*., 2007, 2008). Further, populations exposed to anthropogenic acoustic disturbance have demonstrated an ability to cope with or adapt to sub-lethal effects arising from noise exposure, such as statocyst damage, and the capacity to recover from minor impairment to stress biochemistry and righting reflexes following exposure, except where impairment is incurred due to exposure at close range (Day *et al.*, 2021; Day *et al.,* 2016a, 2016b).

This information, in conjunction with the assessment of potential impacts to benthic invertebrate larvae completed in **Section 7.2.2.2** suggests there are no anticipated population level impacts or changes to ecological function and integrity as a result of exposure to the seismic source. Furthermore, available macrofauna survey data obtained through extensive literature reviews indicates that benthic faunal assemblages within the OA and surrounds are consistent with the broader region and do not include any endemic species.

On the basis that any potential sublethal effects to invertebrates in areas shallower than 512 m will be sub-lethal and temporary and that existing literature has found that effect levels at the effect thresholds adopted here potentially fall within the range of existing background variability, the level of consequence is considered minor and the likelihood that minor effects will occur in this area is likely.

Overall, the residual risk to benthic invertebrates arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Likely)* and therefore, no impacts on populations or ecological function and integrity to benthic invertebrates are anticipated.

7.2.2.2.3 Bony Fish

All fish tested to date have displayed the ability to detect sound and vibration to some degree (Dale *et al.*, 2015), with sounds used by fish for communication, prey location, predator detection, and as a cue for orientation (McCauley and Cato, 2000). The hearing range and sensitivity of individual species of fish is however highly variable (e.g. Ladich and Fay, 2013) but fish generally hear best at low frequencies below 1 kHz (Ladich, 2000).

The hearing sensitivity of bony fishes varies between families and species. Hearing sensitivity is a function of specialised auditory structures in the inner ear (otoliths surrounded by an epithelium of hair cells) and, if present, the swim bladder (Finneran and Hastings, 2000; Nedwell *et al*., 2004). Otoliths are sensitive only to particle motion, while the swim bladder may provide an indirect route for sound pressure to reach the inner ear. The other main mechano-reception system in fish is the lateral line system, which runs along the side of the body of fishes and is more pronounced in some groups of fishes than others. The lateral line system responds to water displacements (particle motion) produced in the near-field of a sound source, as well as to tiny water currents set up by the fish's own motions (Nedwell *et al.*, 2004). Therefore, all fish are sensitive to the particle motion component of sound at close range from an acoustic source or other sound source, while some more specialised fishes with a swim bladder involved in their hearing are sensitive to sound pressure and are capable of detecting less intense noise and a wider range of frequencies compared to less-specialised groups of fish (Popper *et al*., 2014; Hawkins and Popper, 2016; Carroll *et al*., 2017).

Based on their morphology/hearing sensitivities, Popper *et al.* (2014) classified fishes and eggs and larvae into the following categories:

- Group I: Fishes without a swim bladder (or other gas chamber) that can sink and settle on the substrate when inactive. These fish are less susceptible to barotrauma than fishes with a gas-filled space as they can only detect particle motion at cloase range, not sound pressure changes. However, some tissue barotrauma is possible from exposure to extreme sound pressure changes;
- Group II: Fishes with swim bladders, but without a direct connection between the swim bladder and the inner ear. Hearing primarily involves particle motion at close range, not sound pressure; however, the presence of a gas-filled swim bladder means that some limited indirect detection of sound pressure may be possible, and the swim bladder is susceptible to barotrauma if exposed to rapid and intense pressure changes;
- Group III: Fishes with a swim bladder or other gas volume connected directly to the inner ear. These fishes are able to detect both sound pressure as well as particle motion, and are susceptible to barotrauma; and
- Fish eggs and larvae.

In marine fishes, the connection with the swim bladder and ability to detect sound pressure is understood to be present to some varying degree in the families Clupeidae (e.g. some herrings, sardines, pilchards and shads), Gadidae (e.g. true cods such as Atlantic cod and whiting), and some nearshore/reef species relevant to tropical Australia such as Pomacentridae (e.g. damsel fishes and clown fishes), Holocentridae (soldierfishes and squirrelfishes) and Haemulidae (e.g. grunters and sweetlips) (Nedwell *et al*., 2004; Braun and Grande, 2008; Popper *et al*., 2014; Popper and Hawkins, 2019). However, most marine fish species do not have this hearing specialisation.

A great many fish species possess a swim bladder or other gas-filled cavity but do not have a connection with their hearing. This is true of many demersal species in the region, as well as some tuna and billfish species. Fish species that lack a gas-filled cavity altogether, include elasmobranchs (e.g. sharks and rays), some flat fishes, some gobies, some tunas, mackerels and other pelagic and deep-sea species (Casper *et al*., 2012; Popper *et al*., 2014).

Of the many demersal species that occur on the outer continental shelf and the continental slope in this region, none are known to be sensitive Group III fishes (with a mechanical connection between the swim bladder and the inner ear, such as the Clupeidae or Gadidae families).

The current industry practise for investigating and determining impacts and risks associated with seismic emissions for fish are based on the Popper *et al.* (2014) classifications. At the time of developing the exposure guidelines, no quantified data on injury and mortality from seismic sources on fishes had been reviewed by Popper *et al*. (2014). Therefore, the Popper *et al.* (2014) exposure guidelines for mortality/potential mortal injury and recoverable injury for fishes exposed to acoustic emissions are based solely on data from pile driving conducted on predominantly temperate, freshwater fish species. Although MSSs and pile driving both produce impulsive sound, their sound characteristics are markedly different; pile driving impulses result in a more rapid rise time in sound pressure than seismic pulses and it is this rapid rise time that has the greatest potential for trauma (Hastings and Popper 2005; Popper *et al*., 2006).

7.2.2.2.3.1 Mortality and Mortal Injury

There are very few experimental examples of sound being sufficiently loud to result in death or mortal injury (i.e. delayed mortality) to fishes (Popper and Hawkins, 2018). There is no evidence for permanent hearing loss (PTS) in fishes; Popper and Hawkins (2018) suggest PTS may not occur in fishes since they can repair or replace sensory hair cells of the inner ear that have been lost/damaged.

Some experiments have recorded mortality following exposure to seismic emissions (e.g. Weinhold and Weaver, 1972; Matishov, 1992; Booman *et al*., 1996), however, in each case, mortalities occurred to caged fish at very close proximity (<2 m) to the acoustic source which is not representative of real-life exposure. A range of other experiments have not reported mortality following both realistic and unrealistic exposure to exposure levels (see McCauley *et al*. 2003a; Carroll *et al.*, 2017; Meekan *et al.*, 2021). Outcomes of previous seismic surveys completed along the west Australian coastline have not reported mortality of fish that are site attached or those that are considered pelagic from seismic data acquisition activities that have been undertaken. Similarly, these previous surveys have not recorded any substantial changes or impacts to commercial fisheries in these areas.

In many cases, the potential for physical injury and impairment impacts to occur may be dependent on fishes' abilities to move and avoid very high sound levels, and so the potential for physical trauma to occur is typically limited to situations where fish do not or cannot avoid such exposures (e.g. experiments involving captive fish that may not be representative of free-swimming fish). For example, Wardle *et al*. (2001) exposed free-swimming marine fish (juvenile saithe and Atlantic cod, adult pollock and adult mackerel) inhabiting a small reef system, to seismic airguns with a sound peak pressure of 195 – 218 dB re 1 µPa PK. No mortality was observed at these levels, even though some of these species are members of the Gadidae family and have a connection between the swim bladder and inner ear.

Juvenile fish may have similar hearing sensitivity as adults but are potentially more at risk of tissue damage than adult fishes as their smaller size means they have less inertial resistance to the particle motion effects of a passing sound wave in the water column (Popper and Hastings, 2009; Popper *et al*., 2016). However, to date, research into the effects of sound on fishes has been conducted on both juvenile and adult fish and, overall, the exposure thresholds and available research is considered broadly representative of both juvenile and adult stages.

Despite mortality being a theoretical possibility for fish exposed to seismic sound, Popper *et al*. (2014) and Carroll *et al*. (2017) note that physical injury leading to death from seismic sound exposure is likely to be limited to extreme cases and has not been observed in any free-swimming fishes exposed during an actual MSS.

Adopted industry practice levels associated with mortality or mortal injury attributable to MSSs vary between the four classifications as defined by Popper *et al.* (2014) (**Table 66**). These adopted industry practise levels were derived from the adoption of limits calculated following exposure of a limited number of fish species to pile driving activities that included exposure to 960 sound events at 1.2 sec intervals. As such Popper *et al.* (2014) suggested that these values are not definitive, are conservative, and should be treated as interim. The Canadian Science Advisory Secretariat completed a review of available literature and reported that based on available information, that fish mortality could occur at levels that exceed 220 dB (Worcester 2006), while acknowledging that adult fish mortality is considered unlikely from exposure to typical MSS arrays. Given that the reviewed literature reported that mortality and physical injury has only ever occurred within a few metres of the acoustic source, the sound exposure criteria proposed by Popper *et al.* (2014) for mortality and injury are considered to be highly conservative and provide a precautionary approach in the assessment of potential injury and mortality effects to fishes from exposure to underwater noise from MSSs.

In terms of the noise generated from the Otway Basin 3D MC MSS itself, and as discussed in **Section 7.2.2.3.2**, fish will typically move away from the source of acoustic emissions if they are uncomfortable with the noise, thereby minimising exposure and potential deleterious effects (Vabø *et al*., 2002; Pearson *et al*., 1992; Wardle *et al*., 2001; Hassel *et al*., 2004; Boeger *et al*., 2006). Due to the ability of fish to avoid exposure at various spatial scales (even those species that display site specific behaviours) it is likely that mortality would occur at levels that exceed the Popper *et al.* (2014) interim values and are likely to be >220 dB_{peak} (Worcester, 2006). As such it is considered that exposure to a threshold of > 220 dB_{peak} likely represents a more realistic while still conservative level of exposure to seismic emissions to assess the potential risk of fish mortality and potential mortal injury due to seismic activities associated with the current project. Despite the conservatism of the Popper *et al.* (2014) levels, that are currently considered industry practise and have been adopted for this assessment.

For fish without a swim bladder, the UAM (Welch *et al.,* 2023) indicates that the accepted sound pressure level for mortality and potential mortal injuries of 213 dB_{peak} (Popper et al., 2014) are not predicted at horizontal distances greater than 70 m from the acoustic source in waters ranging in depth between 114 m and 1,216 m. At 50 cm above the seafloor sound pressure levels of 213 dB_{peak} were predicted out to 75 m from the acoustic source (**Table 66**). Threshold levels of 207 dB_{peak} for mortality and potential mortal injuries for Group II (fishes with swim bladders whose hearing does not directly involve the swim bladder or other gas volumes) and Group III fishes (fishes whose hearing does directly involve a swim bladder or other gas volume) as well as fish eggs and larvae are not predicted at horizontal distances greater than 150 m from the acoustic source across all water depths modelled (114 m – 1,216 m). At 50 cm above the seafloor sound pressure levels of 207 dB_{peak} were predicted out to 156 m (**Table 66**).

Table 66 Predicted onset distances (single pulse and SEL_{24h}) for the mortality of fish (Groups I, II, and III) and fish eggs and larvae, both within the water column and at the seafloor

	Mortality and potential mortal injury	
	Per Pulse (peak)	SEL_{cum}
Group I: Fishes without a swim bladder that can sink and settle on the substrate when inactive	>213 dB	>219 dB
Maximum modelled distance (horizontal) (at model scenario depth) (m)	70 (114 – 1,216)	110
Maximum over seafloor modelled distance (at model scenario depth) (m)	75 (114)	-
Group II: Fishes with swim bladders whose hearing does not directly involve the swim bladder or other gas volumes **Group III:** Fishes whose hearing does directly involve a swim bladder or other gas volume **Eggs and larvae**	>207 dB	Group II, fish eggs and larvae: 210 dB Group III: 207 dB
Maximum modelled distance (horizontal) (at model scenario depth) (m)	150 (114)	110 (for both Group II (incl. fish eggs and larvae) and Group III)
Maximum over seafloor modelled distance (at model scenario depth) (m)	156 (114)	-

Site attached fish (those that rely on benthic habitats) may have limited ability to move away from acoustic emissions. Fishes within the OA that are generally considered site attached including a range of commercially targeted species such as flathead, orange roughy, pink ling, eastern school whiting, blue-eye trevalla, ribaldo, gummy shark, and sawshark would be able to undertake movements to avoid acoustic emissions that may cause mortality or mortal injury. Despite the potential vulnerability of site attached fish with limited mobility to acoustic emissions, assemblages that have been exposed to anthropogenic acoustic disturbances have been reported to exhibit high levels of resilience and quick recovery following exposure (Lefèvre and Bellwood, 2015; Syms and Jones, 2000).

The biomass and diversity of site attached fishes is typically greatest in the photic and upper mesophotic zones (<60 m depth) which subsequently decreases with increasing depth (Abdul Wahab *et al.*, 2018). Moreover, deeper areas (up to 60 m depth) that are proximal to reef and shoal habitats typically contain a higher abundance and diversity of fish than areas of similar depth that are not associated with reef and shoal habitats (Abdul Wahab *et al.*, 2018). Although the AA overlaps with the West Tasmania Canyons KEF, this KEF has not been identified as an area of increased fish biomass/diversity but is instead designated a KEF on account of the benthic invertebrate communities present. Due to the water depths involved within the AA, site attached fish are not at increased risk of mortality or mortal injury from the Otway Basin 3D MC MSS.

Pelagic species within the OA including those that are targeted and retained in commercial fisheries (e.g. SESSF, SPF, ETBF, SBTF) include various species of mackerel, tuna and billfish, blue grenadier, and redbait (see **Section 4.7.3**). These species typically do not have a large swim bladder if present at all and as such mortality and mortal injury is based on conservative industry practice levels predicted to occur within a maximum (per pulse) horizontal distance of 70 m from the acoustic source (**Table 66**). Species that inhabit the pelagic environment can avoid areas that exceed current conservative industry practise levels. Moreover, as the acoustic source is moving pelagic fishes would have a period as the source approaches to avoid the area and thus avoid exposure to levels that may cause mortality or mortal injury.

In the 2D Tie Line AA that extends onto the continental shelf and minimum water depths of approximately 115 m, the maximum ranges on the seabed where injury may occur are 75 m for Group I fishes (no swim bladder) and 156 m for Group II and Group III fishes. It is again highlighted that the Popper *et al.* (2014) thresholds for injury and mortality are likely to be highly conservative, and studies have indicated that much higher received sound levels up to 246 dB re 1 µPa PK have not resulted in injury or mortality. The potential for mortality and injury is therefore likely to be limited to within very close proximity of the acoustic source. Importantly, the potential for mortality and injury to occur is dependent on fishes' abilities to move and avoid very high sound levels. The demersal fish assemblages that are expected to be present on the outer continental shelf are generally wide-ranging, free-swimming species. The available studies on the behaviour of both captive and free-swimming fishes exposed at close range to MSSs (see **Section 7.2.2.3.2**) generally indicate an increased level of startle response and increased swimming activity with increased sound levels or in response to exposure at close range. It is highly unlikely that fishes will remain within range of the acoustic source where mortality/injury can occur. Injury or mortality may only occur in the immediate vicinity of the acoustic source in the unlikely event that the acoustic source commences operation suddenly at full power without the opportunity for fishes to avoid increasing sound levels (i.e. no soft-start management measures). However, soft-start measures will be implemented (as detailed in **Section 3.5.3** and **Table 84**). Therefore, demersal fishes in the AA can reasonably be expected to exhibit an avoidance response and swim away from the approaching acoustic source before sound levels approach levels that may result in injury or mortality.

It is considered that based on the results of the UAM (Welch *et al*. 2023), and the limited and at times contradictory evidence to suggest acoustic emissions can result in fish mortality, that the consequence of acoustic emissions on fishes (both site attached and pelagic) including commercially important species is considered to be minor; with no detectable adverse effects on fish populations and rapid recovery from any impact is expected to occur. it is considered that fish mortality associated with exposure to acoustic emissions may occur in exceptional circumstances. As such, the residual risk based on implementation of identified mitigation measures of fish mortality due to exposure to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Rare*).

7.2.2.2.3.2 Fish Egg and Larvae Mortality

Fish eggs and larvae have been reported to be susceptible to mortality or mortal injury when exposed to seismic emission levels of >207 dB_{peak} and >210 dB_{SEL} (Popper *et al.,* 2014). Throughout the OA there are no known specific spawning aggregation sites critical for the ongoing viability of fish species present including species that are targeted and retained in commercial fisheries that operate within the area. These species are generally widely distributed and have extended spawning seasons (e.g. blue warehou and blue grenadier spawn June to September, striped trumpeter spawn July to October, and snapper spawn August to November (see **Table 37**). Within these spawning periods individuals typically spawn multiple times and generally display broadcast spawning strategies.

Spawning multiple times over an extended spawning period can offset potential risks and high inherent levels of mortality experienced by fish eggs and larvae. Natural rates of mortality experienced by fish eggs and larvae can be very high in some cases greater than 50% per day and often more than 20% per day (Houde and Zastrow 1993; Tang *et al.*, 2014). Spreading reproductive investment and output reduces the potential that an individual batch of eggs and larvae experience adverse environmental conditions, predation, or exposure to deleterious effects at both local and regional scales.

Under a 'worst-case' scenario Sætre and Ona (1996) reported that mortality rates for fish larvae and fry for five fish species (cod, saithe, herring, turbot and plaice) due to exposure to seismic emissions is likely to represent 0.45% of the total larvae population. Sætre and Ona (1996) concluded that mortality rates caused by exposure to acoustic source sounds are so low compared to natural mortality that the impact from MSSs must be regarded as insignificant (Sætre and Ona, 1996). In addition, as both the source of seismic emissions and the water body in which fish eggs and larvae are present are moving, exposure of fish eggs and larvae to industry practise levels that may result in mortality or mortal injury would at worst occur over a very short period for eggs and larvae originating from any particular location. Fish eggs and larvae that are released during subsequent spawning events during the extended spawning period would not be exposed to the same conditions and risk of exposure to seismic emissions. Due to these factors impacts to fish eggs and larvae associated with the Otway Basin 3D MC MSS would be orders of magnitude smaller than regional scale environmental drivers that influence survival and recruitment of fish species to natural environments and into commercial fish stocks that are harvested by commercial fisheries operating in the area.

It is considered that the consequence of acoustic emissions on fish eggs and larvae within the OA (including for commercially important species retained as part of the CTS, SESSF, ETBF, and SBT (long-lining) fishery) is minor; with no detectable adverse effects on fish populations and rapid recovery from any impact is expected to occur. Based on available evidence, it is considered likely that fish egg and larvae mortality associated with exposure to acoustic emissions has occurred at very small scale during other similar seismic data acquisition projects. As such, the residual risk of fish egg and larvae mortality based on exposure to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Likely*) (**Table 49**).

7.2.2.2.3.3 Recoverable Injury

Exposure to seismic emissions have been reported to cause recoverable injuries to fish. These recoverable injuries have included fin hematomas and capillary dilation (*Popper et al.*, 2014). Temporary reduction in hearing sensitivity (i.e. TTS) due to fatigue and temporary changes to the epithelium (hair cells) of the inner ear and/or damage to auditory nerves innervating the ear (Worcester, 2006; *Popper et al.*, 2014) has the potential to occur in some fishes exposed to intense sound pressures for prolonged periods of time (Smith *et al*., 2006; Popper *et al*., 2014; Liberman, 2015).

TTS has been demonstrated in some fish species and is variable in duration and magnitude (Popper *et al*., 2014). This shift is temporary on account of fish sensory hair cells being constantly added (e.g. Popper and Hoxter, 1984; Lombarte and Popper, 1994) or replaced when damaged (Smith *et al*., 2006; Schuck and Smith, 2009). Following cessation of the damaging sound, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of sound exposure (e.g. Scholik and Yan, 2001; Amoser and Ladich, 2003; Smith *et al*., 2011). In all cases where TTS occurred, it was only found after multiple exposures to intense sounds (e.g. <190 dB re 1 µPa rms) or as a result of long-term exposure (e.g. tens of minutes or hours) to somewhat less intense sounds (Popper and Hawkins, 2018). While experiencing TTS, affected fishes may have a decrease in fitness in terms of communication, detecting predators or prey, and/or assessing their environment (Popper *et al*., 2014; Popper and Hawkins, 2018).

The impact threshold of 186 dB re 1 µPa2·s proposed by Popper *et al.* (2014) is based on data from Popper *et al.* (2005) where exposure of a freshwater fish species with a connection between the swim bladder and inner ear to an SELcum of 186 dB re 1 µPa2·s resulted in approximately 20 dB difference in hearing threshold. Fish that showed TTS recovered to normal hearing levels within 18 – 24 hours.

Predicted onset distances for recoverable injuries and TTS in each of the three fish classifications derived by Popper *et al.* (2014) are provided in **Table 67.**

Table 67 Predicted onset distances (single pulse and SEL_{24h}) for recoverable injury and temporary threshold shift in fish (Groups I, II, and III), both within the water column and at the seafloor

	Recoverable injury		TTS	
	Per Pulse (peak)	SELcum	Per Pulse (peak)	SELcum
Group I: Fishes without a swim bladder that can sink and settle on the substrate when inactive				
Accepted sound exposure threshold	213 dB PK	216 dB SEL_{24}	-	186 dB SEL_{24}
Maximum modelled distance (horizontal) (water column) (m)	70	110	-	4,800
Maximum over seafloor modelled distance (seafloor) (m)	No exceedance predicted	No exceedance predicted	-	4,500
Group II: Fishes with swim bladders whose hearing does not directly involve the swim bladder or other gas volumes **Group III:** Fishes whose hearing does directly involve a swim bladder or other gas volume				
Accepted sound exposure threshold	207 dB PK	203 dB SEL_{24}	-	186 dB SEL_{24}
Maximum modelled distance (horizontal) (water column) (m)	140	110	-	4,800
Maximum over seafloor modelled distance (seafloor) (m)	No exceedance predicted	No exceedance predicted	-	4,500

The potential for TTS effects to occur as a result of cumulative sound exposures has been evaluated based on the accumulated sound energy over a 24-hour period for different locations within the OA and using the 186 dB re 1 µPa2·s threshold (Popper *et al*., 2014). The UAM (Welch *et al*. 2023) predicts that TTS at the seabed may occur up to 4.5 km from acquisition lines on the upper continental slope in water depths down to approximately 1,500 m, although this range reduces to 1.7 km in water depths of approximately 2,000 m. Although not modelled, the ranges to TTS in deeper waters are expected to reduce further. The maximum modelled distance is measured broadside of the acquisition lines, and the distance to impact for fishes located fore and aft of the approaching seismic vessel will be limited to shorter distances.

The SEL24h cumulative metric reflects the dosimetric impact of noise levels based on the assumption that an animal is consistently exposed to such noise levels at a fixed position during that 24-hour period. The radii that correspond to SEL24hr typically represent an unlikely worst-case scenario for SEL-based exposure since, more realistically, fishes would not stay in the same location or at the same range for 24-hours. Therefore, this method is highly conservative and a reported radius of SEL24hr criteria does not mean that any animal travelling within this radius of the source will suffer hearing impairment. As the Seismic Vessel is constantly moving along each sail line at an average speed of 4 – 5 knots, to exceed industry practice levels it would require a fish to actively follow the course of the vessel for a 24-hr period to be exposed to acoustic emissions that are considered capable of causing TSS.

An expert peer review undertaken by Popper and Hawkins (2019) in relation to the potential for TTS impacts to demersal fishes from a 3D MSS in Australia highlighted the reasons why the 24-hour period is conservative. Each individual fish is exposed to relatively "loud" sounds for only a short period of time and the exposure is only at levels that might lead to potential effects if the fish is relatively close to the sound source for an extended period. The modelled SEL24h scenarios are not weighted to the auditory thresholds of fishes and so account for many seismic pulses over the 24-hour period that are likely too low and distant for fishes to be able to hear (Popper and Hawkins, 2019). With regard to TTS, Popper and Hawkins (2019) concludes:

- TTS is not likely to occur as the signal will not be very much above threshold for the bulk of fishes since they have no hearing specialisations. In the event that there is TTS, the amount of TTS is likely to be limited;
- If TTS occurs, the duration of exposure to the most intense sounds that could result in TTS will be over just a few hours and its level is likely to be sufficiently low that it will not be possible to easily differential it from normal variations in hearing sensitivity;
- Even if fish do show some level of TTS, recovery will begin immediately following the cessation of the most intense sounds, and recovery is likely to occur, to a limited extent, between seismic pulses; and
- Based on very limited data, recovery within 24-hours (or less) is very likely.

As with the mortality and injury impact predictions, the modelled extent over which TTS has the potential to occur in fishes is likely to be highly conservative and the mobile demersal fishes are likely to move away from the approaching acoustic source before sound levels reach those that may result in significant levels of TTS. It is possible that some fishes may not avoid the approaching acoustic source completely and some level of TTS is possible, but as Popper and Hawkins (2019) summarises, recovery is likely to occur within 24-hours and the potential for such effects to have significant implications on the fishes' fitness and survival is low.

The 2D tie line that will extend into the continental shelf has not been modelled in the context of SEL24h exposures given that acquisition in shallower continental waters will be limited to a few hours of active source time (not a full 24-hour period) and the acoustic source will approach shallower waters in the endfire direction (associated with smaller sound propagation and effects ranges). Therefore, accumulated SEL exposures and the range to TTS effects along the 2D tie line on the continental shelf is expected to be localised and not exceed the ranges modelled for the slope region.

Following exposure to seismic emissions no significant changes in the diversity and abundance of fish species on various reef and non-reef habitats in western Australian waters have not been reported (Miller and Cripps, 2013, Meekan *et al*., 2021). These results indicate that even if fish experience TSS, the effect is not detectable at a population level within a short-, medium- and long-term following exposure (Meekan *et al*., 2021).

The presence of tuna in the Otway Basin supports a significant commercial fishery, particularly within South Australian waters (see **Section 4.7.3.2.5**). Song *et al.* (2006) reported on an examination of the inner ear of Atlantic bluefin tuna (*Thunnus thynnus*) and report that the inner ears were structurally adapted to protect the ear during high-speed acceleration and during dives to great depths. Song *et al.* (2006) concluded that the studied species does not have particularly good hearing and that in order for sound to be detected by tuna, it would have to be very loud. Therefore, fish would have to be close to even the loudest anthropogenic sources in order for detection to take place (Song *et al*., 2006). Furthermore, Song *et al*. (2006) stated that "*unless bluefin tuna are exposed to very high intensity sounds from which they cannot swim away, short - and long-term effects may be minimal or non-existent. And, considering that bluefin tuna are powerful swimmers and divers, it is possible that if they encounter a sound that is very loud to them, they will move away from the sound rapidly enough to result in minimal exposure. At the same time, if the tuna are, for some reason, unable to move away from very intense sounds, there is still the possibility that there could be damage to the inner ears*". Furthermore, Popper *et al*. (2013) and Dale *et al*. (2015) reported that the hearing range of Pacific bluefin tuna (*Thunnus orientalis*) is narrower than for other fishes that do not have specializations for sound detection and therefore have poorer hearing abilities than other fishes. Based on the findings of Song *et al*. (2006), Popper *et al.* (2013), and Dale *et al.* (2015) on closely related tuna species (i.e. of the genus *Thunnus*), it is assumed that SBT also have low hearing abilities and are unlikely to suffer TTS from acoustic emissions during the Otway Basin 3D MC MSS.

It is considered that based on the results of the UAM (Welch *et al*., 2023), the fast recovery speeds and the implausibility of how cumulative exposure resulting in TTS that the consequence of acoustic emissions resulting in recoverable injury for fishes, both site attached and pelagic (including commercially important species retained as part of the CTS, SESSF, ETBF, and SBT (long-lining) fishery) is considered to be minor; with no detectable adverse effects on fish populations and rapid recovery from any impact is expected to occur. As stated in Halvorsen *et al.* (2013), although TTS can arise from prolonged exposure to sound, it is not likely to be of great significance for fishes that are only briefly exposed to a source. Based on available evidence, it is considered that recoverable injuries to fish associated with exposure to acoustic emissions may occur in exceptional circumstances. As such, the residual risk of recoverable and TTS injury to fish due to exposure to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Rare*).

7.2.2.2.4 Elasmobranchs

Very little research has been undertaken on the effects of acoustic noise or MSSs on elasmobranchs. Sharks differ to bony fish in that they have no swim bladder or other gas filled chambers that can act as secondary hearing organs in the body, so are unlikely to respond to changes in pressure like bony fish may be due to the physiological differences (Myrberg, 2001; Casper *et al*., 2012). As a result, sharks cannot detect pressure changes associated with sound waves (Carrol *et al*., 2017). The lateral line system of shark also does not respond to normal acoustic stimulus and is not able to detect sound-induced water displacements beyond a few body lengths, even with large sound intensities (Myrberg, 2001). There have been reports of sharks approaching and biting active acoustic source in both New Zealand and Australia while sharks including blue sharks and mako sharks have been sighted close to seismic vessels while the source is active. These interactions may be influenced by changes to electromagnetic field associated with the use of data acquisition equipment.

No sound exposure thresholds currently exist for acoustic impacts from seismic sources to sharks and rays, which are sensitive only to particle motion. However, as a conservative approach the Popper *et al.* (2014) guidelines for fish with no swim bladder have been used for this assessment (**Table 66**). The maximum Rmax distances predicted by the UAM (Welch *et al*., 2023) for recoverable injury, potential mortal injury or mortality in Group I fishes (no swim bladder) within the water column is 70 m. The maximum predicted distance to TTS is 4.8 km within the water column, based on the cumulative SEL24h threshold. However, given the free-swimming and highly vagrant nature of sharks, as well as their lack of sensitivity to sound pressure, injury and significant levels of TTS are not expected to occur.

The elasmobranch species potentially present within the AA will be limited to a narrow margin on the upper continental shelf and slope within the northern and eastern extents of the AA and so only subject to exposure if a limited number of seismic lines are acquired along these narrow margins or within the 2D Tie Line AA. White sharks are an exception to this with their known distribution extending across both shelf and oceanic areas. Shark species are highly vagrant and naturally cover large distances, and as such, short-term exposures from the transient acoustic source is expected to result in only localised behavioural responses and movements of sharks (**Section 7.2.2.3.3**).

It is considered that based on the available evidence that the consequence of acoustic emissions on elasmobranchs is minor; with no detectable adverse effects on populations and rapid recovery from any impact is expected to occur. Based on available evidence, it is considered that physiological effects to elasmobranchs associated with exposure to seismic emissions may occur in exceptional circumstances. As such, the residual risk of physiological impacts to elasmobranchs due to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Rare*) and considered to be acceptable (**Table 49**).

7.2.2.2.5 Cephalopods

As described in **Section 4.5.4**, there are 17 species of cephalopod (including various species of squid, octopus, and cuttlefish) that may be present within the OA, none of which are listed as EPBC threatened fauna. Given their pelagic lifestyle, where they spend the daytime near the seabed and then rise to the surface waters to feed at night, there is the potential for squid and cuttlefish to come near the acoustic source during the Otway Basin 3D MC MSS. Octopus, on the other hand, are primarily reef dwelling benthic species so are less likely to be encountered in concentrations of significance in the OA.

Cephalopods have been found to respond to sound between 30 and 600 Hz, being most sensitive between 100 and 200 Hz, suggesting that they detect sound similarly to most fish, with the statocyst acting as an accelerometer through which they detect the particle motion component of a sound field (Kaifu *et al.*, 2008; Mooney *et al*., 2010).

Acoustic trauma has been observed in captive cephalopods. Laboratory studies that exposed two species of squid to seismic noise showed that *Alloteuthis sublata* was tolerant to a sound level up to 260 dB, yet *Loglio vulgaris* was fatally injured at levels of 246 – 252 re 1 µPa within 3 – 11 minutes of exposure (Norris and Mohl, 1983). Andre *et al*. (2011) exposed four cephalopod species (two squid, one octopus and one cuttlefish species) to low frequency sounds with SELs of 157 ± 5 dB re 1 µPa (peak levels at 175 re 1 µPa). All exposed animals exhibited changes to the sensory hair cells (statocysts) responsible for balance, with damage becoming more pronounced in animals continuously exposed for up to 96 hours. This study estimated that trauma effects could occur out to 1.5 – 2 km from an operating acoustic source (Andre *et al*., 2011). However, the exposure experiments in both studies are difficult to relate to real life MSSs due to either the exposure levels or the duration of the exposure event.

Fewtrell (2003) found that southern calamari squid (*Sepioteuthis australis*) were able to detect acoustic noise at approximately 158 dB re 1 µ Pa, or at 2.1 km from a 2,678 in^3 acoustic source, although no trauma examination was conducted. However, Fewtrell (2003) did conclude that MSS noise of up to 192.4 dB re 1 µ Pa (0.2 km from a 2,678 in^3 acoustic source) is not lethal for *S. australis*.

Carroll *et al*. (2017) undertook a literature review on the physiological and physical effects of MSSs on fish and invertebrates, including cephalopods (**Table 68**). Studies were categorised into presence or absence of a response depending on the level of exposure. The level of exposure was determined to be either "*realistic*" for MSSs (i.e. few short bursts of low frequency sound at >1 – 2 m), or "*unrealistic/unknown*" (i.e. continuous sound exposure, >100 bursts of near-field sound exposure in aquaria). The authors found no studies that had used "*realistic*" exposure levels and five that had used "*unrealistic/unknown"* exposure levels, including the Andre *et al*. (2011) study described above. Three had found damage to the statocyst (i.e. Andre *et al*., 2011, Solé *et al*., 2013a; 2013b), one found respiratory suppression (i.e. Kaifu *et al*., 2007), and another found wider ecosystem consequences/stress bio-indicators (i.e. Solan *et al*., 2016).

Table 68 A Summary of the Potential Impacts of Low Frequency Sound on Cephalopods

Effect	Cephalopod
Physical	
Otolith/statocyst damage	3
Organ/tissue damage	1
Mortality/abnormality	1
Physiological	
Metabolic rates*	1
Stress bio-indicators	1
Immune response	
Energy stores	
Behavioural	
Startle response	5
Sound avoidance	1
Predator avoidance	
Foraging	
Reproduction	
Bioturbation	
Key	
(green)	No response at either realistic or unrealistic exposure levels
(red)	Response at realistic exposure levels
(yellow)	Response at unrealistic/unknown exposure levels
(blue)	Possible response (conflicting results)
(grey)	No data, has not been tested

Notes: *Includes proxies for metabolic rate such as food consumption, growth, respiration, developmental rate.
Numbers represent the number of studies reporting the result (as reported by Carroll *et al*., 2017).
Impacts are classified according to the sound exposure treatments as realistic (i.e. short bursts of low-frequency sound at a distance of >1 – 2 m) or unknown/unrealistic (i.e. long duration and/or short distance of <2 m to sound source, nearfield sound exposure in aquaria).
Source: Table adapted from Carroll *et al.*, (2017)

Squid are generally short-lived, fast growing species with high fecundity rates and studies have shown that squid can produce eggs year-round. So, if there was any potential for loss in recruitment over a three-month period, then the squid's life history traits mean they are well adapted to disturbance and the populations would not be at the same risk as those species which only spawn once a year.

Given the ability of cephalopods to move and avoid exposure to some degree and the behavioural responses in studies, exposure to injurious levels is unlikely. This, combined with the finding that a relatively high SEL, was found to be non-fatal to squid, and that larvae and juveniles are most often found in shallow coastal waters, suggests that there is no anticipated long-term risk to squid populations presented by the Otway Basin 3D MC MSS. There is no evidence to suggest that other cephalopod species are more prone to physiological impacts from underwater noise than squid, consequently, the residual risk to cephalopod physiology arising from acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.2.2.2.6 Marine Reptiles

As described in **Section 4.5.5**, there are three species of threatened marine turtle that are known, likely, or may be present in the OA. Only leatherback turtles typically have a temperate distribution and are regularly seen in TAS and VIC waters during the summer months, although sightings are mainly of foraging individuals in coastal and continental shelf waters, not deep offshore waters such as those of the OA.

Marine turtles do not have an external ear but detect sound through bone-conducted vibration in the skill, and by using their shell as a receiving surface (Lenhardt *et al*., 1985). Nelms *et al*. (2016) conducted a thorough literature review of studies that investigate the behavioural and physical impacts of seismic surveys on turtles. Nelms *et al*. (2016) reported that for those marine turtle species for which hearing sensitivities are known (loggerhead, green, leatherback and Kemp's ridley turtles – of which all but Kemp's ridley turtles have a potential presence in the OA), all can detect frequencies between 50 and 1600 Hz, and that this range overlaps with the peak amplitude low frequency sound produced during seismic surveys (10 – 500 Hz). This suggests that turtle hearing will detect seismic operations, although hearing sensitivity is relatively poor compared to marine mammals (Finneran *et al*., 2017) and no studies have assessed physical (tissue) damage to hearing structures. One study (Gurjao *et al.*, 2005), looked for evidence of turtle mortality during 2D seismic surveys off the coast of Brazil. Of the eight dead turtles found in the vicinity, five appeared to have been recently caught and damaged by fishing activity and had subsequently died. The authors do not speculate as to the cause of death for the other three dead turtles, and it is unclear whether any post-mortems were conducted on these individuals.

TTS has been induced in captive playback experiments where loggerhead turtles were exposed to a few hundred seismic pulses at a distance of 65 m (Moein *et al.,* 1994, cited in National Science Foundation, 2011). Although this demonstrates that hearing damage is theoretically possible, the results of captive experiments are of questionable relevance when assessing effects of seismic surveys in an open ocean setting as unlike wild animals, captive animals are unable to move away from the sound source. Instead, the impact of underwater noise on marine turtles is likely to be influenced by the exposure duration, where acute noise from seismic surveys is most likely associated with behavioural effects (see **Section 7.2.2.3.5**) rather than physiological effects (Commonwealth of Australia, 2017a). Physiological effects for marine turtles are probably limited to situations when animals might be exposed at close range for unusually long periods (National Science Foundation, 2011), such situations are unlikely during the Otway Basin 3D MC MSS as the vessel will be moving continuously along pre-determined sail lines; hence exposure to high levels of underwater noise will be transitory for any turtles in the OA.

The underwater noise exposure criteria for physiological effects on marine turtles are presented in **Table 69**. The criteria are based on the recommendations of the US Navy (Finneran *et al*., 2017) which, on account of there being no published data regarding TTS and PTS in marine turtles from impulsive noise sources, base threshold values on extrapolations from other animal groups. UAM results for the Otway Basin 3D MC MSS do not predict PTS or TTS for marine turtles from exposure to a single pulse, but PTS could occur if a turtle was to remain within 110 m of the active source for 24-hours or TTS is possible for turtles that remain within 310 m of the active source for 24-hours. Noting that the likelihood of cumulative exposure is dramatically reduced on account of the movement of the Seismic Vessel, where at a speed of 4.5 knots the Seismic Vessel will travel up to 200 km in 24 hours, and the ability for turtles to spend time with their heads above the water surface to avoid exposure.

Table 69 Noise Exposure Criteria (Finneran *et al.,* 2017) and Modelled Zones of Impact (Maximum Distances from Source to Impact Threshold) for PTS and TTS in Marine Turtles

	PTS		TTS	
	Criteria	Maximum Threshold Distance (m)	Criteria	Maximum Threshold Distance (m)
Single pulse PK	232 L_{pk}; dB re 1 µPa	-	226 L_{pk}; dB re 1 µPa	-
Cumulative Weighted SEL_{24hr}	204 $L_{E,24h}$; dB re 1 µPa²·s	110	189 $L_{E,24h}$; dB re 1µPa²·s	310

Notes: A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).

Acute noise from seismic surveys is considered in the Recovery Plan for Marine Turtles in Australia 2017 – 2027 (Commonwealth of Australia, 2017a). This report acknowledges that loggerhead turtles are known to be sensitive to sounds of between 100 – 400 Hz, and that green, leatherback and hawksbill turtles can detect frequencies up to 1600 Hz, but despite this very little is known of the impact of noise on marine turtles. The report also states that "*Given that the impacts of noise are unknown, a precautionary approach should be applied to seismic work, such that surveys planned to occur inside important inter-nesting habitat should be scheduled outside the nesting season*."

As identified in **Section 4.5.5**, there are no areas for marine turtles within either the OA or EMBA that have been identified as BIAs for any stage (e.g. breeding, nesting, feeding, etc), therefore the OA is not considered to be important habitat and although some marine turtles may be present within the OA, they are not expected to be present in high numbers. The UAM (Welch *et al.,* 2023) modelling predicts that 24-hour cumulative TTS effects for marine turtles could occur out to 310 m from the active source and the zone of impact for 24-hour cumulative PTS is restricted to 110 m around the active source; hence, the risk of PTS or TTS for individual marine turtles is very low, and no anticipated population level effects are predicted. Individual turtles could occur within the highly restricted zone (<20 m) in which PTS or TTS from single pulse exposure is expected; however, individual turtles would presumably be displaced from this area by the hull of the Seismic Vessel (which precedes the acoustic source). Furthermore, a 100 m precautionary Shut-down Zone from the operating source will be applied to marine turtles. The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting.

Consequently, the residual risk to marine turtle physiology arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible* x *Rare*).

7.2.2.2.7 Marine Mammals

Marine mammals are dependent on sound for their survival. They use sound during foraging, reproduction, communication, detection of threats, and navigation, and as a result, are particularly sensitive to anthropogenic noise (Weilgart, 2007; Williams *et al*., 2015; Erbe *et al*., 2018). Both lethal and sub-lethal physiological effects are possible when marine mammals are exposed to high intensity underwater noises at close range. Potential effects include damage to body tissues (resembling decompression sickness in humans), damage to hearing, and chronic stress (Gordon *et al*., 2003). Amplitudes that would result in such effects are unknown for most species, but onset thresholds have been developed for some captive species to predict physiological effects, and these thresholds have been extrapolated for all marine mammals (Southall *et al*., 2019). All thresholds for permanent hearing injury are inferred for ethical reasons (Southall *et al*., 2019).

Shipping noise is highly unlikely to cause permanent hearing damage to marine mammals (Southall and Hatch, 2008); however, long-term exposure may induce a stress response similar to that found in humans that live near busy roads or airports (Wright *et al*., 2007). Chronic stress in response to vessel noise was first hypothesised by Rolland *et al.* (2012) for North Atlantic right whales. These authors reported that following a significant reduction in background noise levels in the Bay of Fundy, California following the events of September 11, 2001, baseline levels of stress-related faecal hormone metabolites in right whales decreased significantly. Lemos *et al.* (2022) have recently documented a similar response in gray whales off the west coast of the US. It is well recognised that chronic stress can supress the immune system, compromising the health of an animal (Weilgart, 2013). Increases in stress hormones have been observed in captive beluga whales and bottlenose dolphins exposed to sound emissions from an acoustic source (Romano *et al*., 2004; Yang *et al*., 2021).

While tissue damage from explosives shock waves has been demonstrated for marine mammals (Finneran and Jenkins, 2012; Koschinski and Kock, 2009) pressure changes from acoustic sources associated with seismic surveys have longer rise times and are less likely to cause tissue damage than explosives. To date there is no definitive evidence of acute physical damage or mortality to marine mammals from seismic surveys (Gordon *et al*., 2003; Broker, 2019); however, Gray and van Waerebeek (2011) reported a single pantropical spotted dolphin showing severe behavioural distress followed by ataxia near a seismic array. Mann *et al*. (2010) reported several incidences of permanent hearing loss in stranded odontocetes for which exposure to high levels of anthropogenic noise cannot be dismissed.

Exposure to high intensity noises can result in a 'threshold shift'; that is a change in the ability of an animal to hear, usually at a certain frequency, whereby sensitivity to one of more frequencies is lost (Southall *et al*., 2007; Southall *et al*., 2019). Threshold shifts can be temporary (i.e. TTS), with recovery after minutes or hours, or be permanent (i.e. PTS). Threshold shifts in marine mammals are more commonly temporary on account of their mobile, free-ranging nature which means they are usually able to avoid dangerously high SELs that could cause PTS. However, exposure to sounds that cause TTS can potentially cause PTS if an animal is repeatedly exposed over a sustained period (Kastelein *et al*., 2016). To cause immediate PTS to marine mammals, levels of acoustic exposure would need to be very high (Richardson *et al*., 1995; Southall *et al*., 2019).

Many factors influence the magnitude of any TTS effect, including the species impacted, the sound frequency, bandwidth, amplitude, exposure duration, recovery period, and whether the noise is continuous or intermittent (Popov *et al.,* 2013). Most TTS studies to date have been conducted on odontocetes as these are the species typically held in captivity on which controlled exposure experiments can occur (e.g. Finneran *et al*., 2015). No TTS studies to date have been conducted on baleen whales; hence, all estimates of TTS onset thresholds for these species are based on extrapolation from species for which data does exist (Southall *et al*., 2019).

The duration of TTS recovery depends on the magnitude of the TTS (i.e. how much hearing sensitivity has changed). For example, bottlenose dolphins exposed to 30 minutes of continuous 160 dB re.1µPa tonal noise exhibited a TTS of 8 dB five minutes after exposure, and full recovery occurred within an hour (Nachtigall *et al*., 2004), whereas dolphins exposed to continuous tonal noise of 186-194 dB re.1µPa exhibited a TTS of 45 dB with almost no recovery in the first hour post-exposure and complete recovery requiring up to four days (Finneran *et al*., 2007). Comparisons between intermittent and continuous sound exposures have been made and reveal that intermittent exposure resulted in a lower TTS than continuous exposure indicating a partial recovery during the pauses of intermittent exposure (Finneran *et al.*, 2010). This is of high relevance to seismic surveys which use intermittent or impulsive noise during operations.

Finneran *et al*. (2015) measured TTS in bottlenose dolphins exposed to impulsive acoustic sources and found much lower magnitude threshold shifts than those caused by continuous tones. In this study a 150 cubic inch (2,000 PSI) acoustic source at a range of c. 4 m to the subject dolphins exposed the animals to SPLs of 200 – 212 dB re.1µPa; however, the maximum TTS recorded was only 9 dB. This study also documented an intriguing anticipatory behaviour whereby two of the three individual dolphins tested independently learnt to turn their heads away from the noise just before each impulse was generated, by doing so, these animals could 'self-mitigate' against exposure. While Finneran *et al*. (2015) did not comment on TTS recovery duration, given the relatively low TTS responses observed, the recovery durations would nearly certainly be short (i.e. less than one hour: cf. Nachtigall *et al*., 2004). Most TTS studies on marine mammals to date document full recovery within 24 hours of exposure (NMFS, 2018). Popov *et al*. (2013) demonstrated that regardless of frequency, an increase in exposure duration resulted in increases to both the magnitude of the TTS and the time to recovery. It is noteworthy that individuals of the same species exposed to the exact same noise under identical experimental conditions can exhibit considerably different TTS responses, indicating significant inter-individual variability in susceptibility to hearing impairment (Popov *et al*., 2013).

Establishing the distance at which threshold shifts are predicted to occur from a given sound source in the marine environment is facilitated by UAM and is dependent on the characteristics of the acoustic source (i.e. frequency, sound speed profile within the water column, seabed composition, water depth and exposure duration: David, 2011). For intermittent noise exposures in the marine environment, cumulative SEL, defined as the total SEL calculated over the time the noise source is active, is often used to characterise exposure (Finneran, 2015). The cumulative SEL considers the received level of sound and the duration of exposure (NMFS, 2018), typically over a 24-hour period, for anthropogenic underwater noise.

To assess the effects of underwater noise on marine mammal auditory function, marine mammals are characterised by 'hearing groups' (**Table 70**) based on their functional hearing range (Southall *et al*., 2019). The low-frequency (**LF**) cetaceans are defined as the baleen whales. These species can hear sound within a frequency range of a few Hz to a few tens of kHz, which coincides with the frequency range of impulsive seismic signals. Odontocetes are considered to have their peak hearing sensitivity at frequencies greater than this, they are grouped as either high-frequency (**HF**) or very high-frequency cetaceans (**VHF**). These species are less sensitive to the low frequency seismic signals, although some of the sound produced is still audible to them. For each hearing group thresholds for the onset of TTS and PTS in marine mammals were determined by Southall *et al*. (2019) and are presented in **Table 70.**

UAM was undertaken by Welch *et al.* (2023) for the purpose of quantifying the potential effects on marine mammals of underwater survey noise (as described in **Section 7.2.1.2**). The predicted zones of impact from a single pulse of the acoustic source are presented alongside the predicted zones of cumulative impact over a 24-hour period (during which c. 12,000 – 14,000 pulses would occur) in **Table 70**. For this EP, both the single pulse and the cumulative modelling results are used to assess the potential zones of impact on marine mammals; however, the larger threshold distance generated by the cumulative results is generally regarded as being of greatest relevance when assessing ecological impacts. In reality, both scenarios are imperfect as the length of time that free-ranging wild animals would spend near the active source would inevitably be longer than a single pulse, but shorter than the 24-hour cumulative metric. Additional animal movement modelling has been undertaken for PBW and SRW to more realistically represent the time that they might be present around the Seismic Vessel on account of the relative proximity of the OA to the blue whale Foraging BIA and the SRW Aggregation BIA.

Whales, as defined by Policy Statement 2.1 include baleen whales and larger toothed whales (e.g. sperm whales, killer whales, false killer whales, pilot whales and beaked whales). For the purpose of interpreting the UAM results it is important to note that baleen whales are LF cetaceans, while the larger toothed whales are typically HF cetaceans. The only VHF cetacean species with a potential presence in the OA are the pygmy sperm whale and dwarf sperm whale and the spectacled porpoise.

Table 70 PTS and TTS Onset Thresholds for Marine Mammals Exposed to Impulsive Noise (Southall *et al.*, 2019) and Maximum Predicted Zones of Impact (Maximum Horizontal Distances) from Source to Onset Threshold.

Hearing group	PTS and TTS onset thresholds – impulsive noise events							
	PTS onset				TTS onset			
	Single pulse PK		Cumulative Weighted SEL24hr		Single pulse PK		Cumulative Weighted SEL24hr	
	PK (dB re 1µPa)	Maximum predicted distance (m)	Weighted SEL24hr (dB re 1µPa2.s)	Maximum predicted distance (m)	PK (dB re 1µPa)	Maximum predicted distance (m)	Weighted SEL24hr (dB re 1µPa2.s)	Maximum predicted distance (m)
Low frequency (LF) cetaceans	219	-	183	500	213	70	168	156,000
High-frequency (HF) cetaceans	230	-	185	-	224	-	170	100
Very-high-frequency (VHF) cetaceans	202	360	155	110	196	680	140	850
Otariid seals	232	-	203	-	226	-	188	100

Note: LF cetaceans = all baleen whales,
HF cetaceans = most dolphins, beaked whales, sperm whales and killer whales
VHF cetaceans = true porpoises, most river dolphins, pygmy/dwarf sperm whales, *Cephalorhynchus spp*, hourglass and Peale's dolphins.
A dash indicates that the threshold is not reached within the limits of the modelling resolution (20 m)

In addition to acoustic propagation modelling results (i.e. UAM, as presented in **Table 70**), animal movement modelling ('Animat' modelling) was also undertaken using movement simulations for PBWs and SRWs, being the cetacean species for which biologically important habitat occurs in the vicinity of the OA. This modelling allowed estimations of the distance within which 95% of the TTS and PTS threshold exceedances would occur ($ER_{95\%}$), along with the probability that individuals within that distance would be exposed above the relevant threshold (P_{exp}). Exposure ranges from animat modelling for PTS and TTS thresholds are typically shorter than those predicted using acoustic propagation modelling because of the shorter dwell time of moving animals which represents a more realistic approach for free-ranging pelagic marine mammals.

Pygmy Blue Whale Animat Results

The results of the animat modelling for PBWs are presented in **Table 71**. The animat scenarios modelled for PBWs were:

- Scenario 1a – Unrestricted animat movements to ascertain exposure ranges to animats in all directions from the survey lines (with maximum exposure ranges associated with offshore, downslope propagation); and
- Scenario 1b – Animat movements restricted to the continental shelf to ascertain exposure ranges inshore towards the continental shelf.

In all scenarios PTS and TTS exposure ranges were substantially less than those estimated by UAM (**Table 70**). Based on the animat results, potential for PTS effects is limited to within 130 m of the seismic source. $ER_{95\%}$ ranges to TTS in the offshore downslope direction are approximately 27.9 – 31.7 km and in the inshore, upslope direction, the ranges to TTS are approximately 15.3 – 15.4 km. The probability of exposure within $ER_{95\%}$ varied between 32 and 53%, indicating that some, but not all, animats exposed within the 95th percentile range were exposed above threshold. This is because simulated whales can move in and out of the modelling range and change their vertical position in the water column. Hence the length of time they are within the exposure radius is moderated by their movements. For example, a whale within the predicted exposure range that is traveling quickly will not accumulate as much exposure as a whale that is travelling slower. Likewise, individual whales may spend more time at depths with quieter sound levels.

Table 71 Animat Modelling Results for the Two Different Scenarios relative to Pygmy Blue Whales

Threshold		Scenario 1a				Scenario 1b			
		Female		Male		Female		Male	
	dB	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)
PTS (SEL_{24hr})	183	120	52	130	53	-	-	-	-
TTS (SEL_{24hr})	168	31,700	46	27,900	50	15,400	32	15,300	33

Dashes indicate no simulated whales were exposed above threshold.

Southern Right Whale Animat Results

The results of the animat modelling for SRWs are presented in **Table 72**. The animat scenarios modelled for SRWs were:

- Scenario 2a – Animat movements restricted to the known core range area to ascertain exposure ranges to animats on the continental shelf inshore from the survey lines; and
- Scenario 2b – Animat movements restricted to the continental shelf to ascertain exposure ranges to animats on the continental shelf inshore from (and including) the survey lines.

Both scenarios provide an indication of the potential zone of effects from seismic acquisition offshore towards sensitive migration, resting, aggregation, calving and breeding habitats (BIAs) in continental shelf waters.

Table 72 Animat Modelling Results for the Two Different Scenarios relative to Southern Right Whales

Threshold		Scenario 2a				Scenario 2b			
		Mother & Calf		No Calf		Mother & Calf		No Calf	
	dB	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)	$ER_{95\%}$ (m)	P_{exp} (%)
PTS (SEL_{24hr})	183	-	-	-	-	40	98	40	97
TTS (SEL_{24hr})	168	-	-	8,510	33	10,800	61	11,000	67

Dashes indicate no simulated whales were exposed above threshold.

Based on the animat results, potential for PTS effects is limited to within 40 m of the seismic source. $ER_{95\%}$ ranges to TTS inshore of the survey lines is not predicted to occur (Scenario 2a), although when accounting for animals moving within the survey lines (Scenario 2b), the $ER_{95\%}$ range to TTS is 11 km. Based on these results, it can confidently be predicted that TTS effects will not extend from the OA to the Aggregation BIA (which occurs 14 km north of the OA) or any of the connecting habitat, migration and resting on migration BIAs in coastal waters.

Little is known about the movement of SRWs between aggregation areas and in offshore waters. The Conservation Management Plan for the Southern Right Whale 2011 – 2021 states that as migratory movements to and from calving grounds remain unknown, whales may be exposed to noise interference from seismic surveys during these movements (CoA, 2012). There remains the potential for TTS effects in SRWs offshore as they approach or disperse from shelf waters, however, given that these animals will be migrating/transient and some level of behavioural avoidance is likely, the potential for this to occur is limited.

Summary of modelling results relevant to physiological thresholds for marine mammals

The key results for physiological effects as predicted from both the UAM and the animat modelling can be summarised as follows:

- The UAM predicts that if baleen whales are present within 500 m of the active source over a 24-hour period they could experience PTS due to cumulative exposure. The animat modelling results, however, predict that the onset distance for cumulative PTS reduces to a maximum of approximately 130 m for PBWs and 40 m for SRWs when animal movement is accounted for;
- Temporary hearing damage (i.e. a TTS) is predicted by the UAM results for baleen whales should they remain within a 156 km radius of the active source for 24 hours. However, the animat modelling results predict that the maximum onset distance for 24-hour cumulative TTS for PBWs is approximately 32 km, and for SRWs is approximately 11 km;
- Exceedance of the onset threshold for PTS in high-frequency cetaceans is not predicted within the resolution limits of the acoustic propagation model. This means that even if high-frequency cetaceans are within 20 m of the active source for extended periods, no permanent hearing damage is expected. A TTS could occur if high-frequency cetaceans are within 100 m of the active source for 24-hours. However, the likelihood of this occurring is virtually nil as free-ranging pelagic animals would only be expected to remain in proximity of the active source for a short time (minutes) even if they were curious enough to investigate the towed seismic equipment at close range;

- Very-high-frequency cetaceans within 110 m of the active source could suffer cumulative PTS over a 24-hour period and TTS could occur due to cumulative exposure if very high-frequency cetaceans remain within 850 m of the active source for 24-hours. However, the UAM results suggested that exposure to a single pulse could elicit PTS beyond the predicted cumulative distance, with PTS out to 360 m. Because of this discrepancy the EP has assessed the effects of underwater noise of these species using the maximum onset distances of 360 m and 850 m respectively for PTS and TTS; and
- Exceedance of the onset threshold for PTS in otariid pinnipeds is not predicted within the resolution limits of the acoustic propagation model. This means that even if fur seals or sea lions are within 20 m of the active source for extended periods, no permanent hearing damage is expected. A TTS could occur if any individuals are within 100 m of the active source for 24-hours. However, the likelihood of this occurring is virtually nil as free-ranging pelagic animals would only be expected to remain in proximity of the active source for a short time (minutes) even if they were curious enough to investigate the towed seismic equipment at close range. In addition, seals are also able to avoid loud underwater noise by swimming with their heads above water when necessary (Mikkelsen *et al*., 2017). On this basis, no specific controls are warranted or proposed to protect pinnipeds from physiological effects of underwater noise.

General Controls to Address Potential Physiological Effects

All Australian marine mammals are fully protected under the EPBC Act, so the potential for causing physiological damage during any MSS is taken extremely seriously. This is particularly important for those species that have a threat classification; of which the following have been identified as having a 'known or likely' presence in the OA during the Otway Basin 3D MC MSS (see **Table 25**): blue whales (*endangered*), southern right whales (*endangered*), fin whales (*vulnerable*), and sei whales (*vulnerable*).

Based on the modelling results for cumulative TTS and PTS onset distances, the standard Shut-down Zones recommended in Policy Statement 2.1[16] are insufficient to manage the risk of auditory impairment to baleen whales during the Otway Basin 3D MC MSS. This coupled with the high likelihood of encountering PBWs in and around the blue whale foraging BIA for most months of the year (see **Table 26**) and the close proximity of the OA to the SRW Aggregation BIA, mean that additional management procedures are necessary to address the risk that the Otway Basin 3D MC MSS poses to baleen whales. The proposed control measures that will be implemented to protect marine mammals from physiological effects are discussed below, and are collated in **Appendix M**.

Animat modelling was undertaken to better understand the risk that the Otway Basin 3D MC MSS poses to PBWs and SRWs. This modelling incorporated species-specific ecological parameters to understand how animal movement (vertically and horizontally) will affect risk of exposure to these species during relevant life stages. Animat modelling therefore provides exposure ranges that are significantly more realistic than those produced by UAM; hence Animat modelling results have been used to underpin the control measures for these species in an effort to avoid potential physiological effects as outlined for PBWs and SRWs presently. In addition to the species-specific controls, the general Management Procedures (**MP**) listed below will be implemented and will afford protection to all marine mammal species. In addition, while standard management procedures outlined in Policy Statement 2.1 will be adopted for the Otway Basin 3D MC MSS, TGS has adapted some of these measures to provide increased protection to marine mammals. These are marked with an 'AC' superscript to denote an 'additional control'.

[16] A 3+ km observation zone, a 2 km low power zone and a 500 m shutdown zone.

- MP 1: During daylight hours at least one marine fauna observer (**MFO**) will be on duty at all times from the Seismic Vessel and one MFO will be on duty at all times from the Attending Support Vessel[17] to undertake continuous visual observations for marine mammals[AC].
- MP 2: MFOs will implement a 5+ km Observation Zone[AC] from the acoustic source[18]. In practise this means that MFOs will be required to scan as far as possible towards the horizon given the prevailing sightings conditions. In those circumstances when monitoring of the Observation Zone is a pre-requisite to certain operations (see **AMP 1**), the minimum radius permissible will be 5 km. Note that the implementation of this Observation Zone does not prohibit Low Visibility or Night-time Operations (see **MP 9**) but whenever conditions allow, this zone will be monitored.
- MP 3: During daylight hours, Pre Start-up Visual Observations for the presence of whales within the 5+ km Observation Zone will be undertaken for at least 30 minutes before the commencement of the Soft Start Procedure.
- MP 4: If no whales have been sighted within the relevant Shut-down Zones, Soft Start Procedures will commence over a 30-minute period.
- MP 5: A 2 km Shut-down Zone[AC] for all whales will be implemented throughout the entire OA at all times[19]. On this basis a Low Power Zone is unnecessary.
- MP 6: A Start-up Delay will occur if a whale enters or is detected in any relevant Shut-down Zone during the soft start. Whale presence within the Shut-down Zone will trigger an immediate and complete shut-down. Soft Start Procedures may only resume after the whale has been observed to move outside the Shut-down Zone, or when 30 minutes have lapsed since the last whale sighting.
- MP 7: If a whale is detected within any nominated Observation Zone during the Otway Basin 3D MC MS, an additional MFO will be stationed on the bridge of the vessel from which the detection was made to assist with observations. The only permissible exception to this is when the off-duty MFO is on a meal or toilet break or is standing-down having reached maximum shift duration for that particular working day. In these instances, a trained crew member will assist with marine mammal observations.
- MP 8: Stop Work Procedures will be implemented for the entire duration in which operations are underway as follows: the acoustic source will shut-down immediately whenever a whale is detected in, or about to enter, any relevant Shut-down Zone. Soft Start Procedures may only resume after the whale has been observed to move outside the Shut-down Zone, or when 30 minutes have lapsed since the last whale sighting.
- MP 9: Low Visibility[20] or Night-time[21] Operations may occur provided that there have not been three or more whale instigated shut-down situations during the preceding 24-hour period[22].
- MP 10: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.

[17] Where 'Attending Support Vessel' means the vessel that is accompanying the Seismic Vessel at close range at any one time. Noting that it could be the support, chase, or supply vessel; but at least one of these vessels is required to be in attendance at any one time.
[18] This distance has been selected on the basis that blue whale detection can be reasonably expected to 5 km over a range of sighting conditions.
[19] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.
[20] When observations cannot extend to 5 km from the acoustic source, e.g. during fog or periods of high winds.
[21] The hours between sunset and sunrise at any given location.
[22] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.

Specific Controls for Blue Whales

Animat modelling has been used to inform the development of the following control measures for blue whales. As the two subspecies of blue whales are difficult to distinguish at sea, these controls will be applied to both subspecies (denoted as **BW/PBW**). This modelling predicts the maximum onset distances for 24-hour cumulative PTS and TTS as 130 m and 32 km respectively. Cumulative TTS effects from acquisition on the continental slope are however only expected to occur to 15.4 km inshore of the active acoustic source on account of reduced sound propagation in the upslope direction. Therefore, acquisition within c. 16 km of the PBW foraging BIAs or within the BIAs themselves has the potential to result in injury or displacement of a BW/PBW from a foraging area[23].

The maximum predicted onset distance for behavioural effects for BW/PBW is 7 km. This distance underpins the Shut-down Zone for BW/PBW. In addition, the 32 km maximum predicted onset distance for TTS has also been utilised in defining several control measures for BW/PBW.

It is noteworthy that the modelling undertaken was conservative, where 1) the worst-case scenarios for noise propagation were modelled to produce maximum estimates of onset distances for TTS and PTS, and 2) the modelled source locations and seasons were those expected to exhibit noise propagation over the greatest distances.

The c. 16 km onset distance for cumulative TTS in the onshore direction has been used to define a buffer zone around the blue whale foraging BIAs (referred to as **BW BIAs** herein). No acquisition will occur within the BW BIAs or the 16 km buffer during the 'peak feeding season' from January to June (inclusive) based on the expected consistent and widespread presence of whales in the foraging areas during these months (Gill *et al*., 2011; 2015; McCauley *et al*., 2018). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2** in **Appendix M**) and will only take approximately 12 hours to acquire.

This spatio-temporal measure has been designed to eliminate any physical or behavioural effects on foraging BW/PBW in the designated BW BIAs during the foraging season; hence, to comply with the requirement of the Blue Whale Conservation Management Plan that blue whales can continue to use biologically important areas without injury and no blue whale will be displaced from a foraging area. On this basis, the protection afforded to BW/PBW in the BW BIAs is very strong during the peak months of foraging area use.

Operations inside the BW BIAs and the 16 km buffer (referred collectively as **BW BIAs/buffer** herein and depicted in **Figure 80**) will be permitted outside these months including during the 'foraging shoulder season' months of September to December and July when whales may be present, but densities are expected to be substantially lower and presence is less consistent. All operations inside the BW BIAs/buffer during the foraging shoulder season will be subject to the use of aerial surveys to assist with BW/PBW detection.

Throughout the survey an Extended Observation Zone (as described in **BMP 4** below) will be implemented and will serve the dual purpose of detecting BW/PBWs at extended distances in order to implement the 7 km Extended Shut-down Zone and to assist with survey planning in order to facilitate operational avoidance of areas where BW/PBWs are present. Several adaptive management measures are also proposed.

[23] Defined in the 'Guidance on key terms within the Blue Whale Conservation Management Plan' (published by DAWE in September 2021) as a designated foraging BIA.

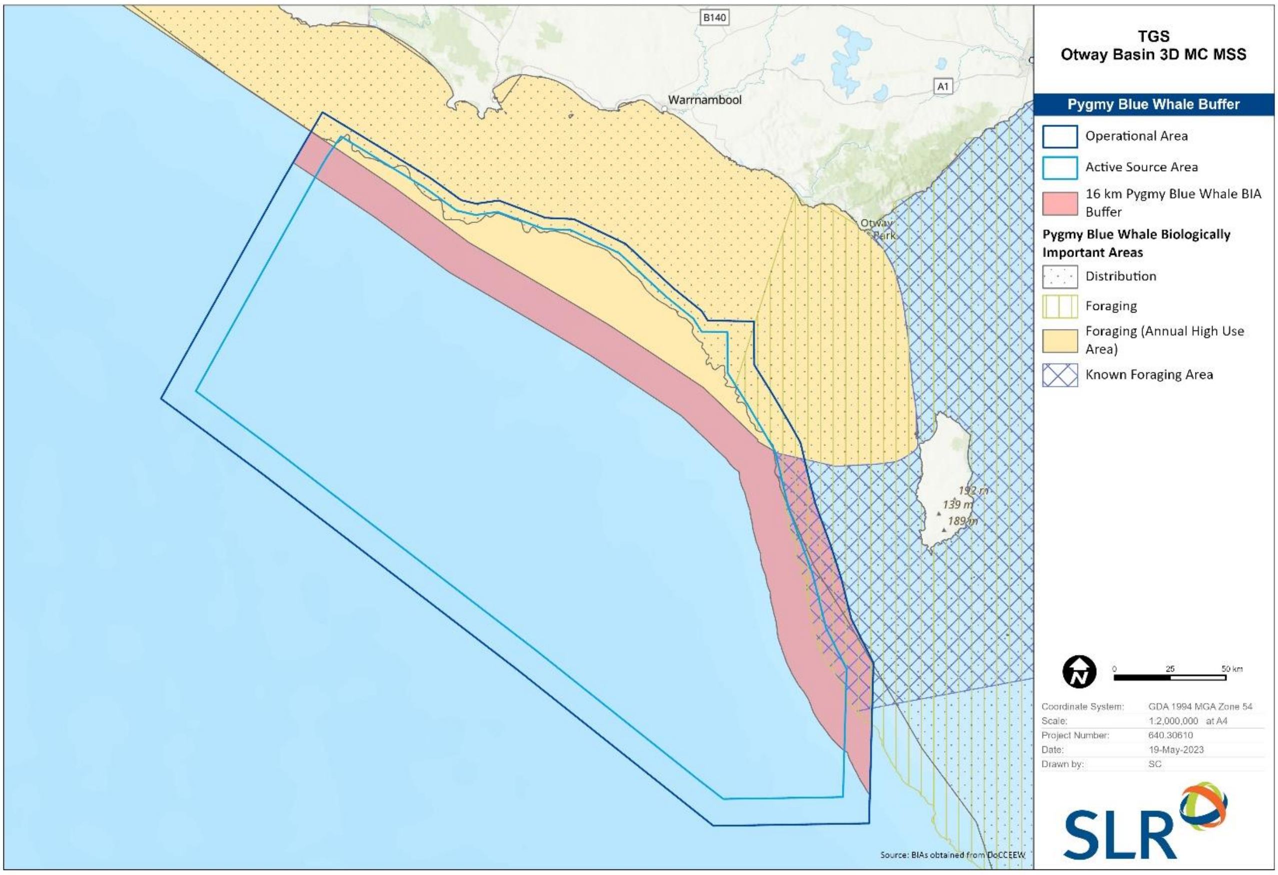


Figure 80   Blue Whale/Pygmy Blue Whale BIAs and 16 km Buffer Zone

In light of the conservative approach taken by the modelling, the proposed controls (as summarised above and detailed below) demonstrate consistency with the objective of the Blue Whale Conservation Management Plan (that "*anthropogenic threats are demonstrably minimised*") and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered). On this basis, acoustic injury to BW/PBW can be managed to an acceptable level throughout the OA; hence, anthropogenic threats (as they relate to physiological impacts from underwater noise) are avoided through robust and adaptive management measures.

The following additional and adaptive management procedures for BW/PBW (denoted with **BMP**) will be implemented during the Otway Basin 3D MC MSS:

- BMP 1: A 16 km buffer will be established around all BW BIAs where they overlap or approach the OA.
- BMP 2: The Seismic Vessel will not activate the acoustic source(s) within any BW BIAs/buffer from January to June (inclusive) which represents the peak foraging season during which BW/PBW are expected to consistently be present at foraging areas in and around the OA at elevated densities. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2** in **Appendix M**.
- BMP 3: A 7 km Extended Shut-down Zone will be implemented for BW/PBW throughout the OA (including the BW BIAs/buffer). On this basis a Low Power Zone is deemed unnecessary.

- BMP 4: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for BW/PBWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5 – 7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5 – 7 km ahead of the seismic vessel to assist with BW/PBW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met:
    a. The MFO onboard the EOZ Support Vessel continues observations for BW/PBWs;
    b. There have been no BW/PBW instigated shut-downs in the preceding 6 hours; and
    c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel.
- BMP 5: Low Visibility or Night-time Operations may occur provided that no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).
- BMP 6: During the 'foraging shoulder season' months of September to December and July the seismic vessel is permitted to operate in the BW BIAs/buffer in accordance with the following protocols:
    a. All reasonable efforts[24] will be made to ensure that aerial surveys will be conducted to assist with the detection of BW/PBW in the BW BIAs/buffer during the 'foraging shoulder season'. Within the seven days prior to commencement of any acquisition in the BW BIAs/buffer aerial surveys will be flown, if possible, to identify any BW/PBWs that may be present. Any such detections will result in acquisition within the BW BIAs/buffers being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of BW/PBWs in the BW BIAs/buffer by relocating to parts of the BW BIAs/buffer where potential impacts on BW/PBWs are less likely.
    b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night-time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.
    c. Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW and to redirect seismic survey efforts in order to avoid BW/PBW that are present.
    d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of BW/PBW from the air.
    e. Start-up (via soft start) can only commence in the BW BIAs/buffer during the 'foraging shoulder season' if the following criteria are met:

[24] Noting that in some circumstances aerial surveys may not be possible due to weather or aircraft availability constraints.

i. A minimum of two hours of daylight remain before nightfall;

ii. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone;

iii. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no BW/PBW have been sighted; and

iv. The start-up location does not occur within 32 km of an area where a BW/PBW detection has been made in the last four days.

- BMP 7: If a BW/PBW is detected in the 7 km Extended Shut-down Zone during the Otway Basin 3D MC MSS the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 32 km away from the last PBW sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible[25], then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone.
- BMP 8: A Start-up Delay will occur if a BW/PBW enters or is detected in the 7 km Extended Shut-down Zone during the soft start, and soft start procedures may only resume once the BW/PBW is observed to move outside this Shut-down Zone or when 30 minutes have lapsed since the last BW/PBW sighting.
- BMP 9: If higher than anticipated numbers of BW/PBW are observed (three or more BW/PBW instigated shut-downs are made during the preceding 48 hour period[26]) at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply:

  a. Acquisition in the BW BIAs/buffer must cease;

  b. Low Visibility or Night-time Operations must cease; and

  c. Normal operations may only resume after 24 hours of no BW/PBW instigated shut-downs.

Specific Controls for Southern Right Whales

Animat modelling has been used to inform the development of control measures for SRW. This modelling predicts the maximum onset distances for 24-hour cumulative PTS and TTS as 40 m and 11 km respectively. Based on these results, TTS effects are not predicted to extend from the OA into the Aggregation BIA (which occurs 14 km north of the OA) or any of the connecting habitat, migration and resting on migration BIAs that occur further afield in coastal waters. The predicted onset distances for behavioural effects for SRWs are significantly larger than those predicted for hearing injury. On this basis, the proposed controls for this species are comprehensively discussed in **Section 7.2.2.3.6** - Potential Behavioural Effects. However, the key controls that will contribute to managing potential physiological effects on SRWs are summarised below:

- A 42 km buffer will be established around the SRW Aggregation BIA where it approaches the OA.
- A spatio-temporal closure will be implemented that prohibits acquisition within 42 km of the SRW Aggregation BIA (**Figure 81**) during the core aggregation months of May to September (inclusive);

[25] For instance, towards the end of the survey when few survey lines remain to be acquired.
[26] Note that any unidentified whale/s will contribute to this count.

- Extended Shut-down Zones will be implemented for SRWs, whereby 1) shut-downs will be triggered by a SRW sighting out to 7 km inside the SRW Aggregation BIA and 42 km buffer during the aggregation shoulder season (April and October); and 2) shut-downs will be triggered by a SRW sighting out to 3 km throughout the remainder of the OA and inside the SRW Aggregation BIA and 42 km from November to March;
- Additional restrictions on acquisition during the shoulder aggregation months of April and October will be required, including the use of aerial surveys to assist with SRW detection, the implementation of extended observation zones, limitations on the timing of soft-starts, and limitations on low visibility and night-time operations; and
- Strong adaptive management measures (including relocation of the Seismic Vessel following any SRW detection) have also been developed to minimise potential noise effects on SRWs throughout the OA.

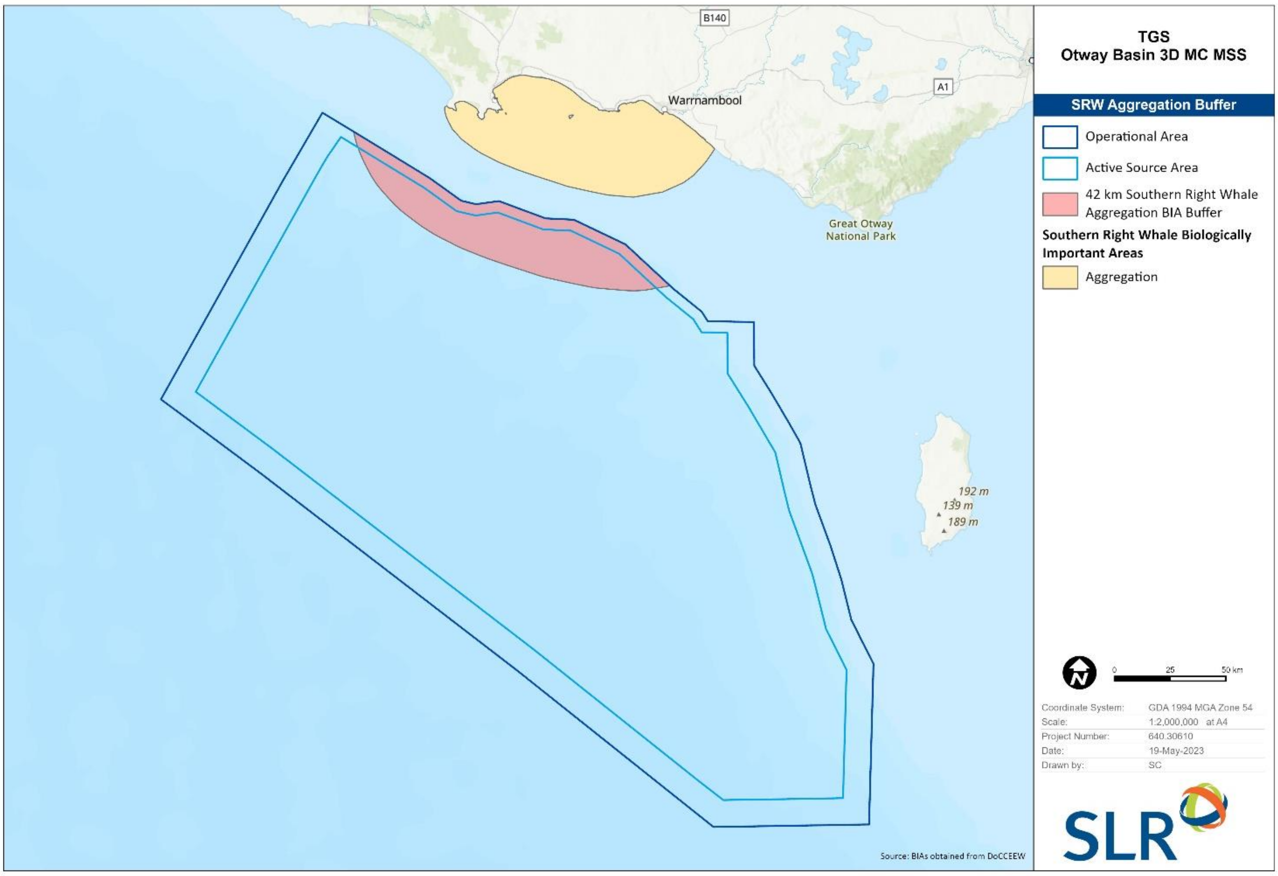


Figure 81 SRW Aggregation BIA and 42 km Buffer Zone

Specific Controls for Other Whales

In accordance with Policy Statement 2.1, the term 'whale' refers to baleen whales and other large, toothed whales such as, sperm whales, killer whales, false killer whales, pilot whales and beaked whales.

For clarity, all whale species other than BW/PBW and SRW are herein referred to as 'other whales', meaning:

- All baleen whales excepting BW/PBW and SRW; e.g. humpback, fin, sei, Bryde's, pygmy right, and minke whales; and

- All large, toothed whales; e.g. sperm whales, killer whales, false killer whales, pilot whales, pygmy sperm whale, dwarf sperm whale, and beaked whales; and
- The spectacled porpoise.

The measures that are specific to 'other whales' have been developed on the basis that free-ranging pelagic animals are not expected to remain in the vicinity of the Seismic Vessel for extended periods and the movement of the Seismic Vessel means that any potential exposure will be transitory in nature.

For 'other' baleen whale species (i.e. all other species of baleen whale, excluding blue whales and SRWs), the UAM results (**Table 70**) predict that 24-hour cumulative PTS could occur out to a maximum of 500 m, but that exposure to a single pulse from the active acoustic source would not elicit PTS even if an animal was very close to the source (< 20 m). The maximum onset distance for 24-hour cumulative TTS is predicted to be 156 km while the single pulse onset distance for TTS is 70 m. It is noteworthy that UAM results show a high degree of variance between modelling scenarios, and, unlike the animat modelling, they do not account for animal movement. While the onset distance for cumulative TTS is large (156 km), the likelihood of this occurring is considered to be low on account of both Seismic Vessel movement and the free-ranging nature of any exposed animals.

While the following other baleen whale species could have a potential presence in the OA (see **Section 4.5.6**): humpback, fin, sei, Antarctic minke, and pygmy right whales, these species are generally expected to be migrating or transient, and no designated BIAs for aggregations of these species exist within the OA. A summary of distribution and density for these species in relation to the OA is provided in **Table 73**.

Table 73 Other Baleen Whales and their Distribution and Density in the OA

Species	EPBC Protected Matters Database; presence ranking in OA	Distribution and Density Considerations
Humpback whale	Known	The OA does not overlap with the well-defined migration routes that occur along the west and east coasts of Australia; hence, densities in and around the OA are expected to be comparatively low. Humpback whales do however occur as frequent visitors to VIC waters including Bass Strait and beyond into SA. Feeding has been observed in the Bonney Upwelling and off Portland particularly during the south-bound migration period of September-October (Gill *et al.,* 2015; SWIFFT, 2021c
Fin whale	Known	Distributional information is limited, but this species has been observed feeding in the Bonney Upwelling between November and May (Gill *et al*., 2015). While a seasonal presence (July to October; Aulich *et al*., 2019) is assumed for in and around the OA, Aulich *et al*., (2022) presented data to suggest presence here is inconsistent and irregular and densities off the south coast of Australia are very low.
Sei whale	Known	Distributional information is very limited but a small number of sightings have been reported from VIC waters and those off TAS (Kato *et al.,* 1996; Gill, 2002), mainly during summer and early autumn months (Gill, 2002). Feeding in the Bonney Upwelling has been observed, but based on the relatively low incidence of sightings, densities of this species are likely to be low..

Species	EPBC Protected Matters Database; presence ranking in OA	Distribution and Density Considerations
Antarctic Minke Whale	Likely	Distributional information is very limited but one possible sighting was made in the vicinity of the OA during an aerial survey (Gill *et al*., 2015). Abundances of this species in Australian waters are though to peak in July and August (Arnold *et al*., 1987), but densities in and around the OA are assumed to be very low based on the rarity of sightings.
Pygmy right whale	Likely	This species is known to occur in the Bonney Upwelling region, although almost all sightings occur within 2 km of the shore (Kemper *et al.,* 2013). Sightings were most frequent from September to February and included feeding behaviours. An additional peak in occurrence was apparent in June (Kemper *et al*., 2013, Gill *et al.,* 2008). No information is available on which to assess densities, but the available data suggests that offshore densities are likely to be lower than inshore waters

On the basis that other baleen whales are 1) probably only present in the OA at relatively low densities and are likely to swim away from the approaching seismic source and 2) UAM does not account for animal movement, it is considered that the 24-hour cumulative UAM results are unrealistic and excessively conservative for defining the extent of observation or shut-down zones for other baleen whales. Although animat modelling has not been undertaken for the species listed in **Table 73**, it is likely that the actual PTS and TTS ranges for these species would be of a similar magnitude to those calculated for PBWs e.g. accumulated exposures may result in PTS effects within tens or a few hundreds of metres from the acoustic source, while TTS effects may extend up to a few tens of kilometres. On this basis, PTS and TTS as a result of cumulative exposures are unlikely to occur and even if TTS were to occur for other baleen whale species, it would be temporary and recoverable. Despite this, the controls as outlined earlier (**MP 1 – 10**) will apply to other whales, including a 2 km Shut-down Zone that will provide excellent protection to baleen whales from all potential PTS effects. In addition, 'Adaptive Management Procedures' and 'Additional Management Procedures for Other Whales' have also been proposed. These are fully described in **Appendix M** and include limitations on start-up procedures at night and during periods of low visibility, and the requirements for MFO use. Further to this controls to address potential behavioural effects to baleen whales are discussed in **Section 7.2.2.3.6**.

Odontocetes (toothed whales and dolphins) mostly belong to the HF hearing group, and as noted in **Table 25** numerous species could potentially occur in the OA, with those species 'known' or 'likely' to be present in the OA and EMBA being sperm whales, killer whales, false killer whales, long-finned pilot whales, dusky dolphins, common dolphins and bottlenose dolphins. Hearing of HF cetaceans is less sensitive to low frequency seismic sound than baleen whales. Effects ranges are therefore significantly reduced for HF cetaceans compared with LF cetaceans (**Table 70**). For HF cetaceans, PTS thresholds are not exceeded and the maximum predicted distance to the 24-hour cumulative TTS effects threshold is only 100 m. This is not a credible scenario, as a dolphin would not remain within 100 m of the seismic source or for a 24-hour period; hence physiological injury is not predicted for HF cetaceans and no specific controls are proposed.

Three species of VHF cetacean have been identified as having a potential presence in and around the OA - the pygmy sperm whale and dwarf sperm whale and the spectacled porpoise. Overall, the risk to VHF cetaceans is limited given their reduced sensitivity to low-frequency seismic sound. The maximum horizontal ranges predicted by modelling (**Table 70**) to exceedance of PTS and TTS thresholds for VHFC are 360 m and 680 m respectively for single impulses. Based on the SEL_{24h} thresholds, the potential for PTS is predicted to be limited to within 110 m from the source, and TTS within 850 m of the source. While a cetacean won't realistically remain within 850 m of the source for long enough to experience TTS from accumulated sound exposures, the results highlight that hearing impairment could occur as a result of exposure to a single impulse in some circumstances.

Implementation of management procedures (**MP 1 – MP 10**) listed earlier in the section will minimise the likelihood of hearing injury impacts occurring. In addition, all VHF cetacean species expected in the OA (pygmy sperm whale, dwarf sperm whale and spectacled porpoise) are included in the definition that has been adopted for 'other whales'. In particular, the inclusion of the spectacled porpoise in this definition ensures that all VHF cetaceans that could be present in the OA are afforded additional protection over that which would have been offered by the standard requirements of the EPBC Act Policy Statement 2.1. This approach aligns with the precautionary approach and has been adopted to protect these species from the potential for permanent hearing damage which the modelling results indicated was possible from a single impulse out to 360 m. This approach also ensures consistency with the requirements of the Australian Whale Sanctuary. Further to this, a passive acoustic monitoring (**PAM**) system will run 24-hours per day on the Seismic Vessel during the Otway Basin 3D MC MSS, with dedicated, trained, and experienced PAM Operators conducting acoustic monitoring for the presence of cetaceans while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedure.

A comprehensive list of controls to address all potential effects of underwater noise on marine mammals are presented in **Appendix M** and **Table 84.**

Assessment Summary – Physiological Effects on Blue Whales

The BW Conservation Management Plan includes the following action: "*Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area*" (see Action Area A.2). In addition, one of the recovery plan interim objectives (Interim Objective 4) is that "anthropogenic threats are demonstrably minimised" and in particular "*Robust and adaptive management regimes leading to a reduction in anthropogenic threats to Australian blue whale are in place*" (Target 4-1). Associated Guidance on key terms within the BW Conservation Management Plan (published by DAWE in September 2021) clarifies that:

- "Injury": For the purpose of interpreting and applying Action Area A.2 of the BW Conservation Management Plan, injury includes both PTS and TTS.
- "Foraging Area": Designated foraging BIAs
- "Displaced from a Foraging Area": A whale is considered to be 'displaced' from a "Foraging Area" if foraging behaviour is disrupted, regardless of whether the whale can continue to forage elsewhere within that Foraging Area. I.e. noise should not:
  - Stop or prevent any blue whale from foraging;
  - Cause any blue whale to move on when foraging; or
  - Stop or prevent any blue whale from entering a Foraging Area
- Mitigation measures must be implemented to reduce the risk of displacement occurring during operations where modelling indicates that behavioural disturbance within a Foraging Area may occur.
- A precautionary approach should be taken to the management of industry activities proposed to occur in or adjacent to designated BIAs (Foraging Areas) due to the increased likelihood of whales foraging in those locations at critically important times.
- Activities proposed to occur outside designated BIA (Foraging Areas) must adopt best practice adaptive management approaches in the event that indicators of whale foraging (such as aggregating in a particular area) are evident to ensure that impacts to whales are not unacceptable e.g. injury or displacement.

- Noting the potential for whale foraging and feeding to occur in areas of high primary productivity outside of designated Foraging Areas, consideration also needs to be given to management of industry activities and underwater anthropogenic noise where opportunistic foraging potential exists. In areas other than designated BIAs (Foraging Areas), where it can be reasonably predicted that blue whale foraging is probable, known or whale presence is detected, adaptive management should be used during industry activities to prevent unacceptable impacts (i.e. no injury or biologically significant behavioural disturbance) to blue whales from underwater anthropogenic noise. In-field observations of actual whale feeding are difficult to detect, so indicators of probable foraging should be used as a proxy.

Therefore, the requirements of the BW Conservation Management Plan provide a precautionary approach, whereby potential injury or displacement of individual animals should be avoided, not just impacts at a population level.

Based on the animat modelling results, it is apparent that un-mitigated acquisition in the Bonney Upwelling region during the PBW foraging season would present a high likelihood of TTS effects and disruption to foraging behaviours (both inside and outside designated BIAs). On this basis, un-mitigated acquisition in the OA between September and July would be inconsistent with the BW Conservation Management Plan, which sets precautionary requirements based on the critically endangered status of the species. Instead, and to ensure consistency with the BW Conservation Management Plan, a comprehensive suite of control measures (as described earlier by **BMP 1 – 9**) are proposed to reduce the potential of such impacts occurring.

By implementing these controls, the potential for physiological effects (i.e. hearing injury) to endangered blue whales is significantly reduced throughout the OA. In particular, the spatio-temporal measures that will largely preclude operations in the BIAs during biologically important times have been designed to eliminate potential physiological effects on foraging BW/PBW in the designated BW BIAs during the peak foraging season; hence, to comply with the requirement of the BW Conservation Management Plan that individual whales can continue to use biologically important areas without injury. The spatio-temporal controls that will be implemented in and around the BW BIAs represent best international practise for minimising underwater noise disturbance in areas of high density and biological importance during key periods (following Chou *et al*., 2021). Further to this, the proposed control measures for BW/PBWs are in accordance with the DAWE Guidelines (2021) which define injury as both permanent and temporary hearing impairment.

In addition to the controls proposed for acquisition within the BW BIAs/buffer, a 7 km Extended Shut-down Zone will be implemented for BW/PBW throughout the OA; hence no PTS is expected as this shutdown distance significantly exceeds the predicted PTS onset distance of 130 m. The potential for any BW/PBW to experience cumulative TTS is also limited given that the movement of the Seismic Vessel (7.4 – 9.3 km/hr) will mean that continuous exposure to injurious operational noise for 24-hours is unrealistic as the seismic vessel will be well beyond the 32 km TTS onset distance within c. 4 hours. Strong adaptive management control measures are also proposed for BW/PBWs throughout the entire OA; hence physiological effects on blue whales can be managed to an acceptable level at all times and locations during the Otway Basin 3D MC MSS.

Assessment Summary – Physiological Effects on Southern Right Whales

As described earlier in this section and based on the Animat modelling results (maximum onset distances for 24-hour cumulative PTS and TTS of 40 m and 11 km respectively), physiological effects for this species are not predicted to extend into the SRW Aggregation BIA (which occurs 14 km north of the OA) or any other inshore connecting habitat, or migration and resting on migration BIAs that occur further afield in coastal waters. Indeed, the predicted onset distances for behavioural effects for SRWs are significantly larger than those predicted for hearing injury, hence these larger onset distances have been used to inform the development of control measures for this species (see **Section 7.2.2.3.6**).

While it is acknowledged that another designated ‘known core range’ BIA for SRWs occurs in the area, the OA only marginally overlaps with this BIA and individual SRWs are expected to traverse this area on their way to and from the more coastal aggregation areas and connecting habitat in which periods of semi-residency and less directional movements are expected. In this context it is noteworthy that throughout the OA, a 7 km Extended Shut-down Zone will be implemented; hence no PTS is expected as this shut-down distance significantly exceeds the predicted PTS onset distance of 40 m. Further to this, the potential for any SRW to experience cumulative TTS is limited given that the collective movement of any individual whale (1.1 km/hr; Burnell, 2001) and the Seismic Vessel (7.4 – 9.3 km/hr) will mean that continuous exposure to injurious operational noise for 24-hours is unrealistic as the seismic vessel will be well beyond the TTS onset distance within 1 – 2 hours. As described in **Section 7.2.2.3.6** no acquisition will be permitted within 42 km of the SRW Aggregation BIA from May to September. In addition, the implementation of strong adaptive management measures throughout the entire OA will significantly minimise the potential for any physiological effects on this species.

The proposed control measures support the recovery objective of the SRW Conservation Management Plan that “*The long-term recovery objective is to minimise anthropogenic threats to allow the conservation status of the southern right whale to improve so that it can be removed from the threatened species list under the EPBC Act*” and Interim Recovery Objective 5 that “*Anthropogenic threats are demonstrably minimised*”.

Assessment Summary – Physiological Effects on Other Whales

While the additional management procedures for other whales eliminate the risk of PTS, they do not eliminate the risk of baleen whales being subject to cumulative TTS during the Otway Basin 3D MC MSS. However, the extended 2 km Shut-down Zone provides strong protection from short-term exposure to high levels of underwater noise and both vessel and animal movement will ensure that the likelihood of physiological impacts on other whales remains low. While the potential for temporary hearing damage to individual whales cannot be dismissed, this would only occur if a whale went undetected inside the proposed precaution zones or if they remained in the general vicinity of the active source for 24-hours.

In accordance with the precautionary approach and to ensure compliance with the purpose of the Australian Whale Sanctuary that cetaceans are not killed, injured, or interfered, the proposed control measures for ‘other whales’ will also apply to the spectacled porpoise for the purpose of this survey. Despite exceeding the requirements of Policy Statement 2.1, this provision addresses the potential for hearing injury to VHF cetacean species even from a single seismic impulse.

7.2.2.2.7.1 Conclusion – Physiological Effects on Marine Mammals

Given their sensitivity to low frequency sound, the risk of physiological effects associated with underwater noise exposure from seismic operations is greatest for baleen whales (LF cetaceans). In general, the potential for TTS effects extends over significant distances for baleen whales but the transient nature of many of these species mean that significant levels of TTS are unlikely to occur, or if it does the effects are recoverable and unlikely to impede the individual's survival. Long term impacts to populations are not predicted. However, it is acknowledged that the potential risk to endangered PBWs and SRWs, which both aggregate in the region to forage or to rest and calf, is greater. On this basis a comprehensive suite of control measures has been developed for these species to reduce the potential of such impacts occurring.

Based on the information outlined in this section, the residual risk to whale physiology (both LF cetaceans and VHF cetaceans) from underwater noise generated by the proposed Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*) as no detectable adverse effects to whale populations or significant physiological effects to individuals from any endangered species are predicted.

The risk to odontocetes (toothed whales, which are largely categorised as HF cetaceans) and otariid seals (fur seals and sea lions) is substantially lower. Policy Statement 2.1 does not require any shut-downs for dolphins or seals, so theoretically, these species could be subject to physiological effects under some circumstances, but the UAM results for HF cetaceans and otariids (**Table 70**) indicate that no PTS is expected and TTS would only occur after prolonged exposure within 100 m of the active source. The likelihood of such prolonged exposure is however virtually nil in free-ranging pelagic animals, and seals have the added advantage of being able to swim with their heads above water to avoid loud underwater noise (Mikkelsen *et al*., 2017). Consequently, the residual risk to the physiology of HF cetaceans and otariids from underwater noise during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible* x *Rare*) and no specific control measures are warranted.

7.2.2.2.8 Seabirds

Since high intensity acoustic disturbances such as those from an MSS have the potential to cause physiological harm to marine mammals and fish, it is reasonable to assume that seabirds could also suffer physiological damage. Seabirds resting on the sea surface are typically startled by an approaching Seismic Vessel and would therefore be displaced from the immediate vicinity of the acoustic source, limiting their exposure to seismic emissions. Birds on the sea surface are unlikely to suffer physiological effects as the Lloyd Mirror effect means that noise levels at the surface are lower than those deeper in the water column (Carey, 2009).

Physiological damage might only occur to those seabirds within the OA that exhibit diving behaviours, and which are in extremely close proximity to the acoustic source. Due to their largely aquatic existence and lack of flight ability, seabirds such as little penguins are expected to be more susceptible to effects from MSSs than other seabirds though they are not anticipated to occur within the OA (Pichegru *et al*., 2017).

Seabirds chase small bait fish as their prey, and it is likely that these small fish would be displaced from the immediate vicinity of the active acoustic source (see **Section 7.2.2.3.2**). Seabirds are expected to detect this change in fish distribution and cease any foraging, which would in turn reduce their exposure to any potential physiological effects.

To date there is limited evidence of physiological effects of MSSs on seabirds, with all documented effects limited to behavioural effects (see **Section 7.2.2.3.7**).

Consequently, the residual risk to seabird physiology arising from acoustic disturbance during the Otway Basin 3D C MSS has been assessed as **Low** (*Minor* x *Rare*).

7.2.2.3 Potential Behavioural Impacts

Behavioural responses are a demonstrable change in the activity of an animal in response to a disturbance (Nowacek *et al.,* 2007) and include movement away from an area to avoid a disturbance, or a change in normal behaviours such as diving, respiration, and swimming speed. In addition to avoidance responses, some animals may be attracted to areas of disturbance. The most commonly observed behavioural response to active MSS operations is avoidance, which has been widely documented for marine mammals (e.g. Goold, 1996; Stone and Tasker, 2006; Thompson *et al*., 2013) and fish (e.g. Engas *et al*., 1996; Slotte *et al*., 2004), and which can lead to the displacement of animals from preferred habitat.

Displacement from an area can lead to relocation into sub-optimal or high-risk habitats, resulting in negative consequences such as increased exposure to predators, decreased foraging or mating opportunities, alterations to migration routes etc. Displacement could also have indirect effects, for instance feeding activities of predators could be disrupted by the displacement of prey species which could lead to energetic consequences.

Discussions on the behavioural impacts from vessel noise and the acoustic source on marine fauna are provided in the subsections below for each environmental receptor. Where possible, discussions have paid particular focus to species that have been identified to be potentially present within the OA/AA through the development of this EP. Perceptual impacts (i.e. changes in vocalisations and masking) are discussed in **Section 7.2.2.4** while physiological impacts have been addressed in **Section 7.2.2.2**.

7.2.2.3.1 Benthic Invertebrates

Benthic invertebrates, particularly fixed or sessile benthic organisms, generally have far lower mobility than pelagic vertebrates, and are often associated with particular habitats. As such, they generally have less ability to avoid an approaching acoustic source. However, invertebrates are generally considered to have limited sensitivity to sound. Marine invertebrates lack a gas-filled bladder and are unable to detect the pressure component of sound waves (Parry and Gason, 2006; Carroll *et al*., 2017) or "hear" sound in the way that mammals and fish can. Instead, invertebrates detect sound by sensing the particle motion component of sound in water and seabed sediments through physiological structures such as sensory hairs, statocysts and muscles, and therefore detect sound at close range (McCauley, 1994; Parry and Gason 2006; André *et al*., 2016; Roberts *et al*., 2016; Edmonds *et al*., 2016; Carroll *et al*., 2017; Popper and Hawkins, 2018). Statocysts are utilised by many invertebrates to maintain their orientation, direct their movements through the water, and may play a key role in controlling the behavioural responses of invertebrates to stimuli.

Exposure to seismic sound can elicit various behavioural responses in benthic invertebrates. Hawkins *et al*. (2015) reports that, at lower sound levels, behavioural responses are more likely to occur than physical and/or physiological responses. Behavioural responses are, however, the most difficult to monitor *in situ* and consequently, many studies investigating the effects of seismic operations on the behaviour of benthic invertebrates are conducted under laboratory conditions or by deploying caged individuals in the field (Carroll *et al*., 2017).

Behavioural responses have the potential to adversely affect a population by, for example, reducing foraging and/or predator avoidance rates. Conversely, they may elicit responses that are brief and pose no overall risk (e.g. a startle response). Research has shown that avoidance behaviours to sound have longer-lasting effects on populations than startle responses. For example, in the former, individuals may move away from an area where MSSs have occurred.

Carroll *et al*. (2017) provided a summary of the potential impacts of low frequency sound on the behavioural responses of marine invertebrates based on a review of the relevant literature. For decapods, foraging, reproduction, and bioturbation response at unrealistic or unknown exposure levels were each reported by one study; three studies reported a possible response, conflicting or anecdotal results with respect to predator avoidance; two studies reported a possible response, conflicting or anecdotal results for startle response; and one study reported no response to sound avoidance.

A range of different habitat/substrate types, and consequently benthic communities will be present in the AA. The seabed of the shelf edge and slope (180 m - >500 m) is expected to consist of muddy carbonate sands and rocky reefs, which disappear with depth (Williams *et al*., 2009). The shelf edge is intersected by canyons and gullies consisting of unconsolidated sediments. The hard substrates and rocky reliefs provide attachment points for a broad range of sessile epifauna, whereas infauna can be found within the sediments. The continental shelf is likely to be sparsely covered by macroalgae, sessile filter feeders (e.g. sponges, bryozoans, bivalves, scallops, stalk crinoids, soft corals), mobile macro-invertebrates (e.g. echinoderms, crustacean) and bioturbating infauna (e.g. annelids) (Hosack and Dambacher, 2012; Williams *et al*., 2009). There are infrequent accounts of octocorals on the continental shelf and deep-water corals in water depths less than 1,000 m. Benthic communities found within the Zeehan AMP include large sponges, lace corals and other sessile filter feeders.

The topography and bathymetry of the West Tasmania Canyons KEF support a high biodiversity of benthic invertebrates. The canyon heads are associated with a high cover of sponges and bryozoans, with the greatest diversity between 200 m and 350 m depth (Schlacher *et al*., 2010). Mobile epifauna (e.g. decapods) are found at rock terraces within the canyons at 300 m to 500 m depth, and bioturbating infauna found below 500 m in muddy sediments (Williams *et al*., 2009).

The particular values and sensitivities with the potential to be impacted by underwater noise are:

- Benthic invertebrate communities of the continental shelf edge, slope and abyssal plane, including sponge communities associated with the West Tasmania Canyons KEF;
- Commercially significant southern rock lobster (*Jasus edwardsii*); and
- Commercially significant giant grab (*Pseudocarcinus gigas*).

Crustaceans

Crustaceans (including lobsters and crabs) detect sound vibrations at close range through their statocysts. Several studies have been undertaken on decapod crustaceans (lobsters, crabs, prawns), both in Australia and internationally, with a range of effects to no effects identified, though none have found any evidence of increased mortality due to acoustic impacts from seismic exposure. Robert and Elliot (2017) reviewed research on particle motion effects to invertebrates, specifically vibration in the seabed, noting studies on particle motion reception in crustaceans, including Goodall *et al*. (1990) who studied the response threshold of Norwegian scampi to acoustic stimuli. It was found that the source of the vibration had to be <1 m away (in the acoustic near field) to initiate a response, confirming that the subjects were detecting particle motion, greater in the near field, rather than pressure. Distinct and reliable responses were exhibited in both the laboratory and the field in response to certain stimuli at low frequencies of 20–200 Hz and ground accelerations of 0.01 – 1.4 m/s2. The sensitivity of the receptor systems in crustaceans has been noted to be much less compared to fish (up to 105 times lower in terms of particle velocity) (Goodall *et al.,* 1990; Fay and Simmons, 1998).

A pilot study on snow crabs (the most commercially valuable fishery off Newfoundland and Labrador) exposed captive adult male crabs and egg-bearing female crabs to approximately 197–237 dB re 1 µPa PK-PK and SELs of <130–187 dB re 1 µPa².s (Christian *et al*., 2003). Caged animals on the ocean bottom at a depth of 50 m were monitored with a remote video camera during exposure to seismic sound and did not exhibit any overt startle response during the exposure period. None of the animals left the immediate area after exposure to the seismic survey sound. Five animals were captured in the snow crab commercial fishery the following year, one at the release location, one 35 km from the release location, and three at intermediate distances from the release location.

Cote *et al.* (2020) investigated the effects of 2D seismic acoustic emissions on the behaviour of free-ranging adult male snow crabs using a multi-year Before-After-Control-Impact approach. Cote *et al.* (2020) found the magnitude of effects on the behaviour of exposed snow crabs were at most small or not statistically relevant.

Payne *et al.* (2007) conducted a pilot study of the effects of exposure to seismic sound on various health indicators of American lobster. Adult lobsters were exposed at approximately 2 m range from a seismic source for either 20 or 200 times to average pressures of 202 dB re 1µPa PK-PK or 50 times to 227 dB re 1µPa PK-PK, and then monitored over several months for changes to survival, food consumption, turnover rate, and serum biochemistry. There were no observations of limited ability of lobsters to right themselves when turned over following exposure. There was evidence of a decrease in serum enzymes and increases in food consumption in the weeks to months post exposure, which may indicate stress effects or potential osmo-regulatory disturbance. Payne *et al*. (2008) did not observe any startle responses in aquarium experiments with lobsters and shrimp exposed to approximately 200 dB re 1µPa PK-PK.

Christian *et al*. (2003) examined the behaviour of snow crabs before, during and after exposure to seismic outputs and observed that, in the laboratory, they reacted slightly when sharp sounds were made near them. However, in the field, caged crab showed no readily visible reactions to the 200 in^3 acoustic source 50 m above them. Tagged crabs did not undergo any large-scale movements out of the area.

For decapods, alarm response to sound have been shown to be highly localised, with alarm behaviour occurring only when they were <10 cm away from the sound source (Goodall *et al*., 1990) and they have shown no such behaviour in response to seismic sound at distances of 1 m or more (Goodall *et al*., 1990; Christian *et al*., 2003).

TAS Giant Crab representatives engaged with during the preparation of this EP state that fishing for giant crab sometimes occurs at depths greater than 400 m. Following feedback during the relevant persons engagement process, in order to protect giant crab within deeper habitats within the OA and AA, TGS will implement a Giant Crab Acoustic Exclusion Area (**Figure 74**), within which there will be no activation of the acoustic source. This area covers the waters along the eastern boundary of the OA and AA that are 1,000 m or less and will protect giant crab habitat from the highest acoustic emissions.

Molluscs and Echinoderms

Molluscs include marine bivalves (e.g. scallops, oysters, mussels, and clams) and gastropods (e.g. sea snails, and abalone). Echinoderms include star fish, sea urchins and sea cucumbers. Like crustaceans, the mechanism of impacts for molluscs and echinoderms are unlikely to be from sound pressure, but rather from particle motion. The physiology and sensory structures of different bivalves and echinoderms is similar and so results of studies on the effects of seismic are broadly representative for species other than those studied.

Wardle *et al*. (2001) monitored molluscs and echinoderms on a shallow water reef exposed to seismic sound with peak sound pressure levels of 218, 210 and 195 dB re 1 µPa at distances of 5 m, 16 m and 109 m respectively. Video observations made over two weeks indicated that the sound did not result in invertebrates moving away from the reef and there was little effect on their day-to-day behaviour.

There is a lack of information with regards to the behavioural effects of MSSs on shellfish. As reported by Carroll *et al*. (2017), two studies have shown evidence of a startle response in bivalves at realistic sound exposure levels (Day *et al*., 2016a; Roberts *et al*., 2015), although only one of these studies used seismic outputs as the sound source. Day *et al*. (2016a) reported that scallops exposed to seismic outputs display a distinctive flinching response, an increase in burial rate and were slower at righting themselves than control scallops. It is possible that the slowed righting response could lead to higher predation rates; however, the ecological implications of this are not clear. No energetically costly responses, such as swimming, have been observed in scallops as a result of exposure to an acoustic source.

It is acknowledged that other invertebrate species are also of significance to commercial fisheries in the broader region, including scallops (*Pecten fumatus*) and various species of abalone. However, no impacts to these species are expected. Commercial scallops are targeted by the BSCZSF, primarily over scallop beds near King Island and Flinders Island. Commercial scallops are mainly found at depths of 10 – 20 m but may also occur down to 120 m. Abalone are targeted by divers in the State abalone fisheries. Greenlip abalone are found at depths ranging from 5 – 40 m and blacklip abalone are generally found in waters ranging between 5 – 20 m (PIRSA, 2012). Abalone larval dispersal and adult movements are generally limited to spatial scales of less than one kilometre with the larvae tending to settle near their parental reefs (Prince, 2005; Morgan and Shepherd, 2006; Miller *et al*., 2008; Mayfield *et al*., 2014; Daume *et al*., 2016). Based on the depth distribution of commercial scallops and abalone, the localised effects of seismic emissions on the behaviour of benthic invertebrates are not expected to impact areas where these species occur.

Sponges, Corals and Soft Filter-feeders

Hastings *et al*. (2008), and Battershill *et al*. (2008) investigated the effects of the Woodside Maxima 3D MSS on hard corals in water depths of approximately 40 – 60 m within south Scott Reef lagoon. Corals received maximum sound pressure levels of 226 dB re 1µPa PK. No change on soft coral abundance was detected and there was no evidence of a behavioural response, such as polyp withdrawal or flaccidity (Battershill *et al*., 2008; Heyward *et al*., 2018).

The 226 dB re 1µPa PK is adopted in this assessment as an indication of no effects to benthic filter feeders, such as sponges and temperate corals.

Summary of Behavioural Impacts on Benthic Invertebrates from Acoustic Emissions

Although formal 'no impact' threshold criteria do not currently exist for benthic invertebrates exposed to seismic sound emissions, the research detailed above provides an indication of the types of impacts that may occur and the associated sound pressures. The majority of research indicates that impacts to marine invertebrates (if any) are limited to within a few metres or a few tens of metres of the seismic source, at most.

TAS Giant Crab Fishery representatives engaged with during the preparation of this EP state that fishing for giant crab sometimes occurs at depths greater than 400 m. Following feedback during the relevant persons engagement process, in order to protect giant crab within deeper habitats within the OA and AA, TGS will implement a Giant Crab Acoustic Exclusion Area (**Figure 74**), within which there will be no activation of the acoustic source. This area covers the waters along the eastern boundary of the OA and AA that are 1,000 m or less and will protect giant crab habitat from the highest acoustic emissions.

It is acknowledged that other invertebrate species are also of significance to commercial fisheries in the broader region, including scallops (*Pecten fumatus*) and various species of abalone. However, based on the depth distribution of commercial scallops and abalone, the localised effects of seismic emissions on the behaviour of benthic invertebrates are not expected to impact areas where these species occur.

The AA has relatively deep waters throughout, where the majority of the water depths of the AA are greater than 700 m. This water depth not only determines what benthic invertebrate species are living within the AA, but it also provides a large separation distance between the acoustic source and the seabed. The typical distances between the acoustic source and the seabed within the OA are far greater than most of the scientific experiments conducted in the literature to assess potential effects of seismic on marine receptors. As such, the residual risk for behavioural impacts to benthic invertebrate species from exposure to acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

The effects of acoustic surveys on catch rates and fisheries which may manifest as a result of behavioural responses discussed in this section are assessed in **Section 7.2.3**.

7.2.2.3.2 Bony Fish

Behavioural effects of noise on fish will vary depending on the circumstances of the fish, hearing sensitivity, the activities in which it is engaged, its motivation, and the context in which it is exposed to sounds (Hawkins and Popper, 2016). The behavioural responses of fish to acoustic disturbance vary depending on species traits, particularly sensory systems and the presence or absence of a swim bladder (Worchester, 2006; Carroll *et al*., 2017). Species which have swim bladders (or other gas-filled chambers) are considered more sensitive and likely to have a behavioural response to sound exposure compared to species with small or no swim bladders (Popper *et al.,* 2014). Responses may include avoidance behaviours, startle reactions, increased swimming speed, change in orientation, change in position in the water column, changes to schooling behaviour (e.g. tightening of school structure), seeking refuge in reefs, and temporary avoidance of an area (Simmonds and MacLennan, 2005; McCauley *et al*., 2000; Fewtrell and McCauley, 2012; Popper *et al*., 2014; Carroll *et al*., 2017). Changes in movement patterns may also temporarily divert efforts away from feeding, egg production and spawning success (Hawkins and Popper 2016). If observed, studies generally report short-term and localised impacts of acoustic disturbance on fish behaviour, with normal behaviour returning within approximately one hour after the removal of the acoustic source (McCauley *et al*., 2000; Pearson *et al*., 1992; Wardle *et al*., 2001).

Pearson *et al*. (1992) exposed captive rockfish to multiple ten-minute periods of seismic emissions from a seismic acoustic source. Schools of rockfish were observed to exhibit a 'startle' response (shudders, flexions of the body followed by rapid swimming) at sound levels above 200 – 205 dB re 1µPa SPL. An 'alarm' response (change in vertical position in the water column to be closer to the seabed, short-term post-exposure behavioural changes) was found to occur above approximately 180 dB re 1µPa SPL, although it was suggested that some individuals begin to exhibit subtle changes in behaviour and position in the water column at sound levels above 161 dB re 1µPa SPL. Changes in behaviour were found to return to normal before the end of the sound exposure or within minutes of the sound ceasing, indicating only very short-term, transient effects and potential habituation to the disturbance (Pearson *et al*., 1992).

Santulli *et al.* (1999) exposed caged European sea bass (a demersal species) to a 2,500 in^3 acoustic source. Limited response was observed at 2.5 km distance. A startle response was observed when the array was at approximately 800 m, but after passing within 180 m, fish behaviour appeared to return to normal within one hour. Increased biochemical stress levels were measured in some fish following exposure, returning to normal levels within 72 hours of exposure. It is noted that exposures of fish in the wild would likely result in avoidance of high sound levels prior to the acoustic source approaching to as close a range and to as high sound levels as those used in the experiment (Santulli *et al.,* 1999).

Wardle *et al.* (2001) exposed tagged, free-swimming marine fish (i.e. juvenile cod and saithe, adult pollock from the sound pressure-sensitive family Gadidae, and adult mackerel from the relatively insensitive family Scombridae) on an inshore reef to sounds from a seismic source (195 – 218 dB re 1 µPa PK). The authors observed the following responses:

- Fish exhibited a startle response (i.e. momentarily performed "C-turns") to all received levels, but no avoidance behaviour or any other longer lasting effects were observed;
- Fish showed no signs of moving away from the reef;
- Slight changes were recorded to the long-term day-to-night movements of two tagged pollock, particularly when located within 10 m of their normal living positions; and
- Exposure to the seismic noise did not interrupt a diurnal rhythm of fish gathering at dusk and had little effect on the day-to-day behaviour of resident fish.

Sivle *et al*. (2016) undertook a pilot study to explore sound source characteristics and experimental design options for evaluating behavioural reactions in mackerel. The authors exposed caged mackerel to a range of playback sounds at close range (2 – 7 m), including filtered playback of seismic pulses recorded at a distance of 8 km with an SEL of 144 dB re 1 µPa2·s. In most tests, mackerels did not react to the seismic sound stimulus. Minor startle responses were observed from a small number of individuals in schools in 20% of tests. A weak or moderate increase in swimming speed was observed in some individuals in schools in 45% of tests, and a weak change in schooling behaviour was observed in a small number of individuals in schools in 10% of tests. In all cases, reactions lasted for the duration of the exposure and returned to normal as soon as the exposure ceased, indicating that some mackerels may show an awareness of seismic sounds at these levels. However, Sivle *et al*. (2016) noted that mackerel are not sensitive to sound pressure, but to particle acceleration, which is likely a key stimulus in this close-range experiment. Sivle *et al*. (2016) also noted that the sound playback technique used had limitations and was not representative of a real seismic signal, suggesting that future experiments should instead use a real acoustic source to obtain more conclusive results. The observations made by Sivle *et al*. (2016) should be interpreted with caution and may not be representative of mackerels' ability to detect propagating sound pressure signals at long distances (i.e. kilometres) from a real MSS.

McCauley *et al*. (2000, 2003) reported that trials involving captive fishes (of various species) exposed to seismic sound showed a common 'startle' response (C-turns), 'alarm' responses (e.g. swimming faster, darting movements and sudden changes in school structure), or more subtle responses such as moving closer to the seabed or grouping closer together. Subtle responses were suggested to commence when sound levels exceeded approximately 151 dB re 1 µPa2.s SEL (approximately 160 dB re 1 µPa SPL). These minimal reactions are likely to be an indication of awareness and perception of the sound rather than a response that could result in potential impacts. Obvious startle and alarm responses were apparent in trials when received sound levels were in the order of 159 – 172 dB re 1 µPa2.s SEL (approximately 168 – 181 dB re 1 µPa SPL). In situations where a behavioural response was observed, fishes were considered to have resumed normal behaviour within 4 – 31 minutes after cessation of the seismic activity. Startle and alarm responses reduced with time, indicating some habituation to the sound. No statistically clear trends in physiological stress response were observed following exposure (McCauley *et al*., 2000, 2003).

Behavioural observations of two tropical snapper species and another coral reef fish species in field enclosures before, during and after exposure to seismic sound showed that repeated exposure resulted in increasingly less obvious startle responses (Boeger *et al*., 2006). This is consistent with the potential habituation suggested by McCauley *et al*. (2000) and by Fewtrell and McCauley (2012).

McCauley and Salgado Kent (2007) observed the behaviour of goldband snapper in fish traps in the Timor Sea in response to emissions from two towed 3,090 in^3 acoustic sources. Maximum signals reached at the closest trap to each pass-by were 200, 202 and 212 dB re 1 µPa PK-PK (equivalent to approximately 194, 196 and 206 dB re 1 µPa PK). No dramatic behavioural responses of fish to the passing seismic source were observed. Fish generally displayed increased activity immediately after entering a trap presumably as they searched for a way out, with this activity reducing with time. Fish which had been in a trap for some time showed increased activity levels as the operating seismic source approached but were 'quiet' when the array passed at the point of closest approach.

Bruce *et al.* (2018) tagged tiger flathead and two shark species in Australia. Sharks moved freely in and out of the study area and exposed sharks did not show any indication of differences in behaviour or distribution compared with control areas. Minor behavioural effects were observed in exposed tiger flathead in the form of increased swimming speed during exposure and changed daily movement patterns after the survey but showed no significant displacement. Overall, there was little evidence for consistent behavioural responses (Bruce *et al*. 2018).

Paxton *et al.* (2017) observed temperate reef fish in 33 m water depth located 7.9 km from a seismic survey line. The authors observed fish abundance and habitat use during the evening hours for three days prior to a MSS and during the evening of the day when seismic activity occurred. Maximum sound levels were estimated to be in excess of 170 dB re 1 µPa. Despite no clear visual evidence of behavioural responses in fishes during the MSS, Paxton *et al*. (2017) noted a 78% decline in abundance in the evening following the MSS. No further investigations were made to assess when fish abundance returned to pre-exposure levels or how far they may have moved. With limited data, it is not clear from this study if reduced abundance is attributed to the MSS or other natural factors such as tidal influence or food availability; however, the study may indicate a possible avoidance response and change in local abundance and distribution.

Meekan *et al*. (2021) undertook a large-scale experiment that quantified the impacts of exposure of an assemblage of tropical demersal emperors (family Lutjanidae), snappers (family Lethrinidae) and groupers (family Epinephelidae) to a commercial-scale seismic source on the North West Shelf off Western Australia. The hearing category of these types of fish is 'Group II'. Baited remote underwater videos and acoustic tagging were used to measure the behaviour and movement of fishes at high, medium, and low exposure sites, and at control sites. The high, medium, and low exposure sites were located at horizontal distances from the path of the seismic source of approximately 0 – 300 m, 2 – 10 km and 11 km respectively. The maximum modelled SEL values received at the high, medium, and low exposure sites were in the order of 180 – 200 dB re 1 µPa2·s, 130 – 160 dB re 1 µPa2·s and 115 – 125 dB re 1 µPa2·s respectively. There were no short-term (days) or long-term (months) effects of exposure on the composition, abundance, size structure, behaviour, or movement of fishes at any exposure sites (Meekan *et al*. 2021). The acoustic tags found little evidence that fish were displaced by the exposure to the seismic source. Movements of tagged fish occurred over a limited area focused on two or three acoustic receivers, and there was no evidence for the departure of tagged fish after exposure, or on their willingness to feed (Meekan *et al*. 2021). These multiple lines of evidence suggest MSS have little impact on the behaviours of demersal fishes in this environment.

Some other studies looking at the behavioural response of sound pressure-sensitive species, such as whiting, Atlantic cod and herring, have reported changes in vertical position in the water column, potential avoidance responses and short-term changes in distribution. For example, Chapman and Hawkins (1969) observed that the depth distribution of free-ranging whiting changed in response to an intermittently discharging stationary seismic source, resulting in fish being exposed to an estimated SPL of 178 dB re 1 µPa. The fish school responded to the sound by shifting downward and forming a more compact layer at greater depth, although temporary habituation was observed after one hour of continual sound exposure (Chapman and Hawkins, 1969).

Slotte *et al*. (2004) monitored the effects of a 3,090 in^3 seismic array on migrating herring and whiting, mapping their distribution and abundance in relation to the seismic survey lines. There was no significant evidence of immediate, near-field scaring reactions on the horizontal scale, but there was some evidence of fish changing position in the water column, moving closer to the seabed in response to the acoustic emissions. Some short-term changes in distribution were observed; fish consistently remained within the immediate vicinity of the survey area, but in a limited number of measurements there was an indication that fish abundance was lower near to the survey area and increased with distance out to a maximum range of 37 km; however, results were inconsistent and not statistically significant, and clear trends were not observed in all cases. Slotte *et al.* (2004) concluded that it was not possible to determine how much abundance and distribution changes were attributed to the MSS or to the fishes' natural migration patterns, food availability or other natural factors. Herring and whiting were found to be abundant in the survey area again after a pause in seismic acquisition and monitoring of fishes for three to four days, indicating that if any displacement did occur as a result of seismic sound exposure, it was temporary (i.e. less than 3-4 days) (Slotte *et al.,* 2004). In similar studies, Engås *et al*. (1996) and Engås and Løkkeborg (2002) reported on the effects of seismic on Atlantic cod and haddock and found that fish abundance was lower in the survey area compared with areas outside of the survey area. The authors hypothesized this may be the result of an avoidance response. Some differences in abundance were still detectable within the survey area five days after completion of the survey (Engås *et al*., 1996; Engås and Løkkeborg, 2002).

Conversely, Peña *et al*. (2013) described the real-time behaviour of schooling herring to a full-scale 3D MSS. No changes were observed in swimming speed, direction, or school size that could be attributed to a transmitting seismic vessel as it approached from a distance of 27 km to 2 km, over a six-hour period. The unexpected lack of a response to the MSS was interpreted as a combination of a strong motivation for feeding by the fish, a lack of suddenness of the onset of sound, and an increased level of tolerance to seismic pulses (Peña *et al*., 2013).

Laboratory experimental approaches to examining the effects of MSSs on fish behaviour typically involve exposing caged individuals to an acoustic source often at intensities and exposure durations that are unlikely to be encountered in the field (Gray *et al*., 2016). In 2007, Woodside engaged a team of more than 20 specialists in the fields of underwater acoustics, coral reef ecology and reef fish biology to design and execute comprehensive investigations into the impacts of seismic airgun noise on (amongst other things) fish behaviour (Woodside, 2007). Behavioural observations of free-swimming fish showed that at close range, airgun noise emissions appeared to cause prominent, short-term effects on fish behaviour. As the vessel approached, fish ceased normal behaviours and moved downward from the water column towards the seabed. Fish began to feed and behave normally again within 20 minutes after the Seismic Vessel had passed. Once the vessel had travelled beyond a distance of ~1.5 km fish numbers and behaviour had returned to normal baseline levels. For caged fish, agitation levels increased with increasing received sound exposure level for the three holocentrid (squirrel fishes and soldier fishes) species studied but were not detectable for the bluestripe seaperch. Alarm responses were too infrequent to analyse (Woodside, 2007). Sonar observations of free-swimming fish showed that individuals tended to move deeper into the water column on approach of the operating seismic array consistently out to 400 m either side of the survey test line. Within 200 m of the survey test line, fish schools moved to the seabed after passage of the operating seismic array and stayed significantly closer to the seabed out to 63 minutes post-exposure. The overall conclusion from the behavioural seismic acoustic exposure experiments was that there was minimal impact on fish behaviour and that any changes that were observed were short term and unlikely to have caused any significant biological or ecological impacts (Woodside, 2007).

Davidsen *et al*. (2019) investigated the effects of seismic exposure on the physiology and behaviour of captive Atlantic cod and saithe. Experimental sound exposures were 18 – 60 dB above ambient. Fish were held in a large sea cage and exposed over a 3-day period. The cod exhibited reduced heart rates in response to the particle motion component of the sound, indicative of an initial flight response. No behavioural startle response to the airgun was observed, although both cod and saithe changed both swimming depth and horizontal position more frequently during sound exposure. The saithe became more dispersed in response to the elevated sound levels. The fish seemed to habituate both physiologically and behaviourally with repeated exposure. The authors concluded that sound exposures induced over the timeframes used in this study appear unlikely to be associated with long-term alterations in physiology or behaviour (Davidsen *et al*., 2019).

Hubert *et al*. (2020) exposed captive Atlantic cod to one hour of playback of seismic airgun sound pulses with a 10-second shot point interval. Cod were placed in a net pen positioned 7.8 m from the speaker. The mean peak sound pressure and particle acceleration levels. It was estimated that the mean SPL of the ambient conditions in the pen was 113 dB re 1 µPa and the mean sound particle acceleration was 61 dB re 1 nm/s2. Results indicated no strong overall pattern of change in swimming patterns or immediate, short-term behaviours during the exposure, compared to baseline periods without playback. However, several individuals changed the time spent in several behavioural states during the one-hour sound exposure; several individuals spent more time transiting and less time being locally active or inactive. This may be indicative of changes in energy expenditure, which may be relevant if sound exposure occurs over the long-term. However, due to experimental design limitations, it was not possible to test the significance of these behavioural state trends (Hubert *et al*., 2020).

Van der Knaap *et al*. (2020, 2021) investigated the effect of a 3.5-day, full-scale, MSS on the movement behaviour of free-swimming Atlantic cod. The closest point of approach to the location of tagged fish was 2.25 km. The authors found that during the MSS, cod did not leave the detection area more than expected from baseline data. However, cod left more quickly than expected from two days to two weeks after the MSS. Furthermore, behavioural analyses indicated that during the exposure, cod decreased their activity, with less time spent being locally active (moving over small distances, showing high body acceleration), and an increase in time spent being inactive (moving over small distances, having low body acceleration). Additionally, diurnal activity cycles were disrupted with lower locally active peaks at dusk and dawn—periods when cod is known to actively feed.

Fishwell Consulting Pty Ltd (2020) provide preliminary results from a multiple – before after control impact analysis of the effect of a full-scale commercial 3D MSS on Danish Seine catch rates of two continental shelf species (flathead and eastern school whiting) in waters off Lakes Entrance, VIC. The MSS was undertaken in four phases in 2020 and preliminary results are currently published for the first three phases. Overall, the analyses provide robust evidence for a negative impact of seismic acquisition on whiting catch rates in the Danish Seine Fishery up to ~100 days following the MSS and flathead catch rates in the Danish Seine Fishery up to ~200 days following the MSS (see **Section 7.2.3.1**. for more detailed results). The reported long term catch reduction of both species contrasts with most other studies where impacts to fish are typically more short term. However, the apparently statistically significant differences between impact and control sites and the reason for the effects lasting 100 – 200 days are notable. Neither of the species studied belong to families of fish that are regarded as being particularly sensitive to changes in underwater sound pressure; however, the relatively shallow sites where the two benthic species are targeted may have experienced significant changes in particle motion near the seabed or ground-borne vibration in seabed sediments that may have resulted in a greater level of behavioural disturbance than to demersal and pelagic species in other studies. Such seabed conditions are not predicted to occur during the Otway Basin 3D MC MSS given the significantly greater water depths.

Fishwell Consulting Pty Ltd (2020) also presents historical logbook data for the period 2014 – 2019, as well as the 2020 MSS. Logbook data demonstrated that catch levels of both species were already highly variable and in decline prior to the MSS. During and after the 2020 MSS in 2020, catch levels at both impact and control sites were some of the lowest on record since 2014 suggesting that there may be other broader factors involved during 2020.

Based on the above body of literature, the following conclusions can be made regarding behavioural effects to fish from MSSs:

- Different fish may exhibit different behavioural responses when exposed to MSS noise, depending on their activities, motivation and the context in which they receive sound;
- Fish may change position in the water column (i.e. move closer to the seabed) as a response to becoming aware of approaching seismic sound (Pearson *et al*., 1992; McCauley *et al.*, 2000, 2003; Slotte *et al.,* 2004; Fewtrell and McCauley, 2012; Miller and Cripps, 2013; Davidsen *et al*., 2019);
- Exposure to higher sound levels at close range to a seismic source may begin to result in more noticeable startle or alarm responses, such as changes in school structure, increased swimming speed and avoidance of the sound source (Simmonds and MacLennan, 2005; McCauley *et al*., 2000, 2003; Fewtrell and McCauley, 2012; Popper *et al.,* 2014; Carroll *et al.,* 2017);
- Many exposure experiments are undertaken using a single airgun and it is not clear how transferrable the behaviours and received SPL/SEL levels are to a full commercial-sized seismic array, particularly if observed behaviours are in response to particle motion close to the sound source rather than to sound pressure. Furthermore, studies on free-living fishes are likely to differ from those with captive fishes because of the many subtle factors that determine tehri behaviour in a natural setting. When studies are done in tanks/enclosures, the sound fields may be very different from those that fish experience in the wild, especially in terms of the magnitude of particle motion relative to sound pressure (Popper and Hawkins, 2019);
- There is some evidence that fish may tolerate gradual increases in sound levels and habituate to repeated sound exposures (Chapman and Hawkins, 1969; McCauley *et al.,* 2000; Boeger *et al.*, 2006; Fewtrell and McCauley, 2012; Peña *et al*., 2013; Davidsen *et al.,* 2019);
- Many studies indicate that fishes resume normal behaviour shortly after cessation of the acoustic disturbance (within minutes to less than an hour), with no evidence of long-term changes (Wardle *et al*., 2001; Pearson *et al.*, 1992; Santulli *et al.,* 1999; McCauley *et al.,* 2000, 2003; Fewtrell and McCauley, 2012; Miller and Cripps, 2013; Davidsen *et al*., 2019); and
- Meekan *et al.* (2021) found no short-term (days) or longer-term (months) effects of seismic exposure on the behaviour and movement of tropical demersal snapper, emperor, and grouper species off northern Australia.

There is some evidence that changes in distribution may persist for longer than the initial change in behaviour, (i.e. position in the water column, schooling behaviours and swim speeds which may return to normal relatively quickly), but their distribution may not return to normal for hours or days. Changes in distribution of fish has been observed in some studies for approximately five days following sound exposure, although such changes are limited to studies that focused primarily on migrating sound pressure-sensitive types of fish with a swim bladder-ear connection (e.g. Clupeidae, Gadidae). These studies also acknowledge that it is difficult to attribute distribution changes directly to the MSS or if they are due to natural factors (e.g migration patterns, food availability, etc.) (Slotte *et al*., 2004; Engås *et al*., 1996; Engås and Løkkeborg, 2002). It is possible that changes to the behaviour and distribution of some sound-sensitive prey species (e.g. herring and sardines) may have some indirect influence on the distribution of larger predatory fishes during the days following exposure and disturbance.

Small changes in behaviour or disruption to diurnal activities of pressure-sensitive species of fish (Gadidae) with a swim bladder-ear connection may indicate that activities such as feeding and energy expenditure can be affected if exposed long-term (Davidsen *et al*., 2019; Hubert *et al*., 2020; Van der Knaap, 2020, 2021), although these species of fish may also habituate to the sound with repeated exposure (Davidsen *et al*., 2019).

Given the limited convergence in results from the available studies, the subjective nature of many assessments and the context under which fish receive sound, Popper *et al*. (2014) do not define exact sound level thresholds or ranges at which masking and behavioural responses may occur. Instead, Popper *et al.* (2014) uses relative risk criteria ranging from high to low. These criteria do not use specific acoustic thresholds, but instead gauge impacts based on general distances from the noise source: near (within tens of metres), intermediate (within hundreds of metres) and far (within thousands of metres). It is difficult to predict the population impacts due to behavioural response because behaviour is context dependent. Behavioural responses of wild animals to sound are likely to vary by species, size, and age class, animal motivation, and in different contexts. Behaviour may be more strongly related to the circumstances of the animal, the activities in which it is engaged, and the context in which it is exposed to sounds (Peña *et al*., 2013; Hawkins and Popper, 2019).

Demersal fishes present within the OA are likely to belong to the Group I or Group II hearing categories. Popper *et al*. (2014) indicates that the potential for behavioural impacts in these categories is high in the near-field, moderate at intermediate distances and low in the far field. Consistent with this, studies relevant to behavioural responses in demersal species indicate that exposure to a mobile seismic source and resultant changes in behaviour are likely to be limited to durations of minutes or hours, or sometimes days, and are most likely to occur within hundreds of metres of the acoustic source as it passes (Pearson *et al*., 1992; Santulli *et al.,* 1999; McCauley *et al*., 2000, 2003; Fewtrell and McCauley, 2012; Bruce *et al*., 2018; Meekan *et al*., 2021). Therefore, behavioural responses in demersal fishes are likely to be localised and temporary.

Commercially significant species with a depth range that corresponds to the AA are identified in **Table 74**. Many of these species are fished by the SESSF CTS and SHS. Based on available information on these fish stocks, most of these species are considered to have a high level of mixing and genetic connectivity and are considered as single genetic stocks throughout their ranges. Many are also highly fecund, releasing thousands or millions of eggs and/or spawn on multiple occasions and have a depth distribution that lies on the periphery of the AA and are largely based in shallower waters. On this basis, occasional localised and temporary behavioural disturbances are not expected to have a material impact on spawning events or ongoing recruitment of the stocks, noting that natural mortality rate for eggs and inter-annual variability in spawning and recruitment due to natural factors can already be high.

Table 74 Depth Range of Commercially Targeted Fishes in the AA

Species	Depth range
Bigeye Ocean Perch	200 – 700 m
Blue Grenadier	200 – 700 m
Blue-eye Trevalla	200 – 900 m
Gemfish	100 – 800 m
Hapuku	50 – 850 m
Mirror Dory	50 – 600 m
Orange Roughy	700 – 1,400 m
Pink Ling	20 – 1,000 m
Ribaldo	450 – 2,500 m
Silver Warehou	50 – 600 m

The AA overlaps with the Zeehan AMP, which has been recognised as a nursery ground for blue warehou and ocean perch, with concentrations of larvae fish of these species found in the AMP. Spawning is generally a sensitive stage in a fish life cycle (Ciannelli *et al.,* 2015), and disturbance during this period could potentially affect the coming year-class strength (McQueen *et al.,* 2022). De Jong *et al*. (2020) suggests that avoidance behaviour after arrival at a spawning ground could lead to movement away from the spawning ground. The response to a stressor (e.g. acoustic emissions) will depend on a trade-off between the cost of being stressed, and the cost of avoiding the stressor (Schreck *et al*., 2016), therefore if the costs of avoidance are too high, animals may remain and spawn (de Jong *et al.,* 2020). De Jong *et al*. (2020) predicted that pelagic spawners are more likely to avoid noise, while species that spawn on specific spawning grounds may remain. McQueen *et al*. (2022) investigated the behaviour of free-ranging Atlantic cod (*Gadus morhua*) over three consecutive years at a spawning ground using acoustic telemetry and a before-after-control-impact approach with one baseline year and two years with seismic exposure. The authors found no evidence that exposure to seismic sources at received levels up to ~145 dB re 1 μPa^2s SEL (comparable to a full-scale MSS at ~5 – 40 km) caused premature departure of cod from the spawning ground. It was suggested that this lack of a detectable response was due to the tagged cod having a strong affinity to the spawning site (McQueen *et al*., 2022).

Pelagic fishes that potentially occur in the AA include SBT, blue mackerel, and yellowtail kingfish. Small pelagic species including Australian herring and Australian sardine (targeted by the SPF) occur in continental shelf waters, but their core distribution does not generally extend far offshore. Many tuna and mackerel species do not possess a swim bladder, or it is poorly developed (Popper *et al*., 2014), indicating they are sensitive only to the particle motion component of sound at close range to an acoustic source. SBT, however, have swim bladders but have no apparent specialist connection with the inner ear (Bertrand and Josse 2000; Song *et al*., 2006). The lateral line system appears to feature in Scombroidei fishes, again indicating fishes are mainly sensitive to particle motion, but some pressure detection is possible. Popper *et al*., (2014) indicate that the potential for behavioural impacts in fishes that do not possess a swim bladder or where the swim bladder is not directly linked to hearing is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres). Therefore, the extent and duration of behavioural impacts to large pelagic fishes in the AA is likely to be like those predicted for demersal fishes. In addition, pelagic tunas and mackerels are highly transient and travel distances of hundreds and sometimes thousands of kilometres. Therefore, the transient nature of the acoustic source and the equally transient nature of pelagic fishes means that behavioural avoidance responses and effects on distribution will be incidental, localised and of short duration by comparison. Their high mobility also means that physiological effects such as injury or TTS are very unlikely to occur (see **Section 7.2.2.2.3.3**).

Australian herring and Australian sardines are targeted as prey by larger pelagic species (i.e. fish and marine mammals) and seabirds. Australian sardines possess the connection between a swim bladder and inner ear that makes them sensitive to sound pressure (i.e. Group III fish). Popper *et al.* (2014) indicates that the potential for behavioural impacts in Group III is high in the near-field and intermediate distances (tens or hundreds of metres), and moderate in the far field (thousands of metres). Behavioural avoidance responses by sardines may therefore occur over several kilometres or more. At times when the acoustic source is operating close to the continental shelf break adjacent to where sardines may be present, or when acquiring in the 2D Tie Line AA, some avoidance and change in distribution of schools of sardines may occur. This may have a more far-reaching secondary effect on the distribution of predatory species that target them. However, given the limited overlap with the continental shelf (a few hours of acquisition along a 2D tie line) and a limited number of lines that will be acquired along the shallower northern and eastern boundaries of the AA, these impacts will be of limited frequency and duration.

SBT are an important apex predator in the SEMR and are a commercially targeted species. Juveniles migrate to continental shelf waters off southern Australia during the summer months (December to April) where those age approximately 2 – 5 years (14 – 25 kg) are caught by the SBTF (Purse Seine Sub-fishery) (Bulman *et al*., 2020). Juveniles move from spawning grounds (in the Indian Ocean between northern WA and Java) within a few months of hatching, most likely utilising the Leeuwin Current to help them reach the waters of the GAB around where they stay in coastal and continental shelf waters through summer and move away into deeper oceanic waters during winter (Bulman *et al*., 2020). As juveniles, a large proportion of the SBT's diet consists of fish (including sardines), squid and krill (Ward *et al*., 2006; Basson *et al.*, 2012). Previous studies into the high levels of chlorophyll-α as a direct result of upwelling mechanisms, coupled with the strong lateral current systems, has been shown to be a direct precursor to krill swarm formation. This in turn promotes the congregation of sardines feeding on the krill, thus providing rich feeding grounds for juvenile SBT near coastal upwellings such as the GAB and Kangaroo Island upwelling systems (Ward *et al*., 2006).

Popper *et al*. (2014) indicates that the potential for behavioural impacts in fishes such as SBT, where the swim bladder is not directly linked to hearing is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres). Based on this information, it is possible that SBT may be able to detect seismic sound and minor behavioural responses may commence when the source is within several kilometres, and reactions may become stronger as the source gets closer (hundreds of metres from the source). Whether SBT react to seismic sound over distances of kilometres will depend to some degree on their behaviours and situational context at the time (Popper *et al.*, 2014) such as their motivation to feed; if feeding as a school, local flow noise within the group is likely to mask seismic impulses except potential detection of particle motion components at very close range.

Noting that a key target prey species of SBT is Australian sardine (*Sardinops sagax*), a Group III fish with the ability to detect sound pressure, sardines are likely to exhibit a behavioural response and avoidance of the seismic source over greater distances than SBT (i.e. several kilometres). Therefore, the active acoustic source is more likely to disturb schools of prey than it is SBT, with the resultant localised change in distribution of sardine schools resulting in SBT looking for prey and feeding in areas further from the acoustic source than they would do otherwise.

SBT hearing capabilities are not sensitive to sound at long range and their hearing mechanisms are likely to only detect high sound pressures and particle motions at close range to the source. Based on the review of literature above, it is likely that SBT may respond to seismic impulses at ranges of hundreds of metres (Song *et al*., 2006; Popper *et al.,* 2014). This is supported by observations made during the TGS Nerites Phase 1 MSS in the GAB in 2014 where schools of tens or hundreds of SBT were observed within several hundred metres of an operating 4,100 in^3 acoustic source, displaying normal swimming and feeding behaviour at the surface, indicating limited or no long-range avoidance or change in behaviours. Flow noise and water motion produced by fast moving and closely spaced SBT during feeding likely mask both sound pressure and particle motion components, except very loud noise at close range.

During consultation, fishery representatives expressed concern on the effect of MSSs on the migration of juvenile SBT in southern Australia. Juvenile SBT move from the spawning ground in the north-east Indian Ocean in their first year of life and move southwards along the Western Australia, coast. Surface-schooling juveniles are found in the continental-shelf region of southern Australia through summer and move away into deeper oceanic waters during winter (Bulman *et al*., 2020). Current evidence suggests that most juveniles return to the GAB in the austral summer, but there is some uncertainty about the proportion that returns (Basson *et al*., 2012). Tagging studies have shown that most migration into the GAB occurs in November and December, but arrivals begin in October and continue as late as January (Basson *et al*., 2012; Evans *et al.,* 2017). Departure from the GAB typically occurs from April/May but can begin from February and can continue until July/August (Basson *et al*., 2012). The majority of juvenile SBT migrate west to the Indian Ocean for winter, a much lesser percentage migrate east to the Tasman Sea, while some overwinter offshore from South Australia (Basson *et al.,* 2012). After about five years of age, SBT are seldom found in nearshore surface areas, and their distribution extends over the southern circumpolar area throughout the Pacific, Indian and Atlantic Oceans (CCSBT, 2009).

Changes in the spatial distribution of SBT in the GAB have been observed during the fishing seasons of the last ~10 years. In the 2012 season, movement of SBT through the GAB was rapid, and fish were distributed further east than usual, resulting in less than 15% of purse-seine catches being taken from fishing grounds used in the previous 20 years (Eveson *et al.*, 2014). Similarly, based on aerial survey data from 2003 – 2013, Basson and Farley (2014) report on a more easterly shift in SBT distribution from waters north-west of Port Lincoln to a more spread-out distribution towards waters west of Kangaroo Island. In subsequent years, ABARES fishing effort data suggests that fish are distributed into the far eastern GAB, with purse seine catches in some years being taken in shelf waters to the west and south of Kangaroo Island. Fishery stakeholders suggested that the eastward shift in SBT distribution is becoming more common. Recent fishing effort indicates that the AA lies outside of the main distribution of surface schooling juveniles during the summer residency period in the GAB. Given the location of the Otway Basin 3D MC MSS (i.e. offshore and further towards TAS than the main distribution areas), it is not expected to present a barrier to migration of young (1-year-old) juvenile SBT into the GAB from the Indian Ocean. The majority of 2 – 5-year-old juvenile SBT also depart the region in a westerly direction towards the Indian Ocean and sound from the Otway Basin 3D MC MSS would not present a barrier to this migration.

The smaller proportion of SBT juveniles that migrate east towards the Tasman Sea or south into deeper waters offshore from South Australia have the potential to be disturbed. However, given the transient nature of the acoustic source and the equally transient nature of SBT, localised behavioural avoidance responses and effects on distribution will be incidental, localised and of short duration by comparison. For example, Basson *et al*. (2012) estimated from tagged SBT that, on average, SBT may travel between 100 and 200 km per day or more during migration and up to 70 km per day when resident. Behavioural disturbance and changes in distribution (potentially ranging from hundreds of metres to several kilometres from the acoustic source, depending on direct disturbance or secondary effects due to changes in the distribution of prey species) are relatively small by comparison.

Evans *et al*. (2017) identified that the timing of past geophysical surveys within the GAB have overlapped the spatial and temporal occurrence of juvenile SBT. The direct measurement of spatial overlap had inherent errors estimating the position of juvenile SBT at exact times. The authors concluded that "*while some parameters could be identified as influencing the behaviour of juvenile SBT, which ones, and the strength and direction of the relationships, varied temporally and across individuals. This made identifying clear relationships between behaviour and environmental parameters difficult, suggesting that the drivers for behaviour of juvenile SBT are complex, and potentially interdependent and covarying in nature*". Further, the authors did observe that during geophysical surveys, at a broadscale, tagged juvenile SBT individuals remained in the GAB during survey periods and for individuals where observations are available across multiple years, the individuals continued to migrate to the GAB over the austral summer period.

Further, catch history reported by the SBTF purse seine sub-fishery in the GAB and the long line sub fishery active in the Tasman Sea, are indicative of approximately 4,000 to 5,000 tonnes of SBT consistently being caught by the purse seine sub-fishery each year each year, as well as increasing quotas for the fishery and increasing catch rates in the east coast long line sub-fishery, despite MSSs occurring in the region during the SBT season in some years, including in consecutive years in 2014 and 2015, and two 3D MSSs occurring concurrently in the central GAB in 2015. Increasing catch levels on the east coast relates to increased Total Allowable Catch for the SBTF (with an apparent corresponding relative reduction in the percentage of TAC from the purse seine sub-fishery), but numbers suggest that SBT continue to migrate to the Tasman Sea where they are caught by the fishery and continue to migrate back to the GAB each summer. Although these numbers present a simplistic account of the situation, there is no pattern that would suggest numbers of SBT are reducing significantly off southern Australia or the Tasman Sea, or that MSSs are preventing or changing the migration of juvenile SBT.

Summary

Overall, the effects on fish from acoustic emissions during the Otway Basin 3D MC MSS will mainly be behavioural. If observed, studies generally report short-term and localised impacts of acoustic disturbance on fish behaviour, with normal behaviour returning within approximately one hour after the removal of the acoustic source (McCauley *et al*., 2000; Pearson *et al*., 1992; Wardle *et al*., 2001). Behavioural changes resulting from exposure to acoustic disturbance have been reported to include startle responses (Pearson *et al*., 1992; Wardle *et al*., 2001; Hassel *et al*., 2004; Boeger *et al*., 2006); modification in schooling patterns and swimming speeds (Pearson *et al*., 1992; McCauley *et al*., 2000; Fewtrell and McCauley, 2012); freezing (Sverdrup *et al*., 1994); and changes in vertical distribution in the water column (Pearson *et al*., 1992; Fewtrell and McCauley, 2012). Evidence of habituation through a decrease in the degree of startle response following multiple exposure events (Hassel *et al*., 2004) suggests responses may be associated with predator avoidance behaviour (Skaret *et al*., 2005) particularly for naïve fish.

Most demersal and pelagic fish species present on the continental shelf, slope and deep waters are not sensitive Group III fishes; they are likely to belong to the Group I or Group II hearing categories. As such, they are not sensitive to sound pressure and are primarily sensitive to the particle motion components of seismic discharges at relatively close range. The potential for behavioural impacts in these categories of fishes is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres).

SBT are not sensitive to sound pressure. Sight and smell are expected to play more of a role in the location and tracking of prey. Behavioural effects are likely to be limited to within hundreds of metres of the acoustic source, with low likelihood of behavioural effects over distances of kilometres. The limited sensitivity of SBT to sound and review of steady catch and quota history in the GAB and Tasman Sea sub-fisheries of the SBTF relative to historical MSS off southern Australia suggest that it is highly unlikely that MSSs are preventing or changing the migrations of juvenile SBT.

Australian sardines in continental shelf waters are recognised as a Group III hearing fish with the ability to detect sound pressure. Sardines may exhibit a behavioural response and avoidance of the acoustic source over greater distances than SBT (i.e. several kilometres). Therefore, the active acoustic source is more likely to disturb schools of prey than it is SBT, with the resultant localised change in distribution of sardine schools resulting in SBT looking for prey and feeding in areas further from the acoustic source than they would do otherwise. These potential flow-on effects to marine food webs are expected to be spatially restricted to within a few kilometres of the Seismic Vessel with baseline conditions resuming relatively quickly after the survey line is complete (Richardson *et al*., 2017). The energetic consequences of a small shift in foraging habitat will likely be negligible for pelagic fish.

It is considered that the consequence of seismic emissions on fish behaviour within the OA is negligible; with no predicted adverse effect to populations expected and recovery from any impact is expected to occur. As such, the residual risk of impacts to fish behaviour based on exposure to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (Minor *x Unlikely*).

7.2.2.3.3 Elasmobranchs

Elasmobranchs detect sound via particle motion and some of the highest sound sensitivity to low frequency sound (~20 Hz to ~1,500 Hz) (Myrberg, 2001; Casper *et al*., 2012), which is the largest proportion of sound frequency that is generated during an MSS (Carroll *et al*., 2017). Due to their lack of swim bladder, sharks are considered to fall into the Group I hearing group. Popper *et al*. (2014) indicates that the potential for behavioural impacts in Group I fishes is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres).

Many species of shark are predatory and use their 'hearing' to locate prey. Therefore, any interruptions to their ability to find/detect food through excessive noise in the environment could impact on the sharks feeding ability (Popper, 2003).

Klimley and Myrberg (1979) found that sharks would withdraw from high intensity sound source that was more than 20 dB re 1 µPa above broadband ambient SPL once within 10 m of the source location. As part of the Gippsland Marine Environmental Monitoring Project, Przeslawski *et al*. (2018a, 2018b) and Bruce *et al*. (2018) found that seismic operations resulted in no evidence of consistent adverse effects on commercial catch rates of sharks, with some species (i.e. elephant fish, broadnose and school sharks) having increased catch rates following the MSS, while others (i.e. gummy shark and saw shark) showed decreased catch rates.

Shark species are highly vagrant and naturally cover large distances, and as such, short-term exposures from the transient acoustic source is expected to result in only localised behavioural responses and movements of sharks. Bruce *et al.* (2018) tagged two commercially targeted shark species (including school shark) and monitored their movements in response to a MSS in Australian waters. The authors noted that both control sharks and exposed sharks moved freely in and out of the study area which did not indicate any changes in behaviour or distribution as a result of seismic exposure (Bruce *et al.,* 2018).

There are four species of threatened and/or migratory species of elasmobranch that have been identified within the EPBC Act Protected Matters Report as potentially present within the OA (see **Section 4.5.3.3**). These species are all considered to be wide-ranging and, with the exception of the white shark, there are no areas of particular biological significance to elasmobranchs within the OA. The OA overlaps with distribution BIAs for white sharks, although density of white sharks within these areas is expected to be low.

Little gulper sharks and school sharks are listed as 'conservation dependant' species protected from overfishing. Little gulper sharks are restricted to the upper continental slope, typically in water depths between ~200 m and 700 m (Last and Stevens, 2009). Tagging found little gulper sharks have a home range up to 50 nm and move freely between the shallow and deeper margins of their distribution (Williams *et al*., 2012). School sharks are a temperate demersal species found on the continental shelf and slope that can be found to depths of 550 metres.

The residual risk of behavioural impacts to elasmobranchs from acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*) with no impacts to populations due to behavioural changes expected.

7.2.2.3.4 Cephalopods

Studies have shown that seismic sounds can elicit a behavioural response in cephalopods. Fewtrell and McCauley (2012) described behavioural responses of squid (*Sepioteuthis australis*) such as a startle (squid inking) and avoidance response at a sound exposure level of 162 dB re 1µPa^2.s and an increase in swimming speeds at levels above 147 dB re re 1µPa^2. s. Aggressive behaviours were also brought about following exposure to the acoustic stimulus. The study reports on responses relative to SEL. No assessment of particle motion is provided so scaling up of the experiment to a commercial scale MSS may not necessarily induce the same responses at the same SELs and responses may be limited to close proximity of the source. The SELs reported by Fewtrell and McCauley (2012) have been used in the UAM report (Welch *et al*., 2023) as the noise threshold for squid/octopus startle (inking) response. UAM results (Welch *et al.,* 2023) indicate that a behavioural response (i.e inking startle response) may occur in cephalopods at distances of 1 – 2.4 km from the acoustic source.

Caged cephalopods that were exposed to acoustic sources demonstrated a startle response above 151 – 161 dB re 1 µPa and tended to avoid acoustic disturbance by exhibiting surface behaviours (McCauley *et al*., 2000). During this study it was found that the use of soft-starts effectively decreased the startle response. TGS will be operating in accordance with the EPBC Act and will be undertaking soft-starts on activation of the acoustic source.

Fewtrell (2003) looked at the response of southern calamari squid (*Sepioteuthis australis*) to MSS noise, finding avoidance behaviours once noise levels exceeded 158 dB re 1 µPa, and significant increases in alarm responses with noise exceeding 158–163 dB re 1 µPa. There was a decrease in the frequency of alarm response for repeated exposures, perhaps suggesting that they became habituated (Fewtrell, 2003). Fewtrell and McCauley (2012) also noted that squid showed fewer alarm responses with subsequent exposure to the acoustic source, suggesting either habituation or impaired hearing. Samson *et al*. (2014) found that cuttlefish became habituated to repeated 200 Hz pips at 150 dB and 165 dB, and Mooney *et al*. (2016) found that squid became habituated during sound exposure trials using 140 – 165 dB. McCauley *et al*. (2000) suggested that thresholds affecting squid behaviour occur at 161 – 166 dB re 1 µPa rms.

Fewtrell (2003) found that feeding squid ate immediately after noise exposure, suggesting rapid recovery, where it was noted that food appears to be a powerful stimulus to these animals – "*….The presence of food in an area could override the stimulus to leave an area affected by seismic survey noise*". This is supported by McCauley *et al*. (2000a), who found that captive squid strongly associated the service dinghy with feeding, to the point where squid approached the dinghy to be fed immediately after the cessation of acoustic noise operations (from the same location). McCauley *et al*. (2000a) also found that cephalopods moved to the water surface during MSS simulation and given sound exposure is lower at the surface due to the 'Lloyd Mirror Effect' this could indicate avoidance behaviour to the sound.

In a literature review on the effects of acoustic noise from MSSs, Carroll *et al.* (2017) categorised studies into the presence or absence of a response from cephalopods depending on the level of exposure (**Table 68**). Carroll *et al*. (2017) found four studies where cephalopods exhibited a startle response to realistic MSS noise. These included Fewtrell and McCauley (2012), McCauley *et al*. (2000a), Samson *et al*. (2014), and Mooney *et al*. (2016). Carroll *et al*. (2017) included a fifth study in this list, Komak *et al*. (2005), where juvenile cuttlefish were exposed to local sinusoidal water movements of different frequencies (0.01 – 1,000 Hz) produced by a vibrating sphere placed 5 mm above their heads. This resulted in a startle response with no evidence of habituation, but the methods are not realistic or comparable to an MSS under the Carroll *et al*. (2017) definition.

Given their pelagic lifestyle, there is the potential for squid and cuttlefish to come near the acoustic source during the Otway Basin 3D MC MSS. However, squid are generally short-lived, fast growing species with high fecundity rates. These life history traits mean they are well adapted to disturbance. Furthermore, none of the cephalopod species recorded in the OA are included in the EPBC Act List of Threatened Fauna.

UAM results (Welch *et al.,* 2023) indicate that a behavioural response (i.e inking startle response) may occur in cephalopods at distances of 1 – 2.4 km from the acoustic source. A typical behavioural response to an acoustic source is likely to include being startled (McCauley *et al*., 2000); however, studies have shown that squid quickly become habituated (Fewtrell and McCauley, 2012), and this behavioural disturbance does not appear to influence feeding (McCauley *et al*., 2000a). The life history traits of cephalopods mean they are well adapted to disturbance and combined with the above findings that they appear to become habituated to acoustic release and display other behaviour that indicates rapid recovery, suggests that there is no anticipated long-term risk to populations presented by the Otway Basin 3D MC MSS. Consequently, the residual risk of behavioural impacts to cephalopod species from acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.2.2.3.5 Marine Reptiles

As described in **Section 4.5.5**, there are three species of threatened marine turtle that are known, likely, or may be present in the OA. Only leatherback turtles typically have a temperate distribution and are regularly seen in TAS and VIC waters during the summer months, although sightings are mainly of foraging individuals in coastal and continental shelf waters, not deep offshore waters such as those of the OA. The primary pathway for behavioural effects to marine turtles during the Otway Basin 3D MC MSS is considered to be through alterations to at-sea foraging behaviours.

Compared to cetaceans and fish, research on the impacts of underwater noise on turtles is scarce. Lenhardt (1994) found that loggerhead turtles managed to minimise exposure to seismic simulations in a confined environment by swimming to and remaining at the water surface. Also, in a confined environment, McCauley *et al*. (2000a) observed an alarm response (rapid swimming) in caged loggerhead and green turtles when acoustic source levels exceeded 166 dB re 1 µPa rms. Swimming behaviour was described as more erratic once acoustic source levels reached 175 dB re 1 µPa rms (McCauley *et al.*, 2000a) and this level has subsequently been adopted as the ‘behavioural disturbance’ threshold.

As Nelms *et al*. (2016) points out, studies carried out within the confines of a cage or tank are biased by the acoustic properties of the immediate environment, and results may differ in an open ocean environment where behaviour may change because turtles are able to swim away from the acoustic source. Observations of turtle behaviour at sea are difficult because they require calm sea conditions, and it is often difficult to distinguish behavioural response from variables other than the acoustic source sounds, such as the presence of the Seismic Vessel, the towed equipment, and the observation vessel. Nelms *et al*. (2016) also raises the issue of subjective and variable interpretation of turtle behaviour by different observers, giving the example of one study reporting "*no signs of panic of distress*" during a seismic survey, where behaviour consisted of either 'steady swimming' or 'diving' to avoid the vessel, whereas similar studies categorised diving as a startle response or avoidance behaviour (Nelms *et al*., 2016).

The UAM (Welch *et al.,* 2023) indicates that sound pressure levels >166 dB re 1µPa and >175 dB re 1µPa are not detected at any horizontal distances greater than 4.18 km and 1.37 km, respectively (**Table 75**). These are maximum over depth ranges, therefore the ranges in the upper water column where marine turtles may be present will likely be significantly less. As turtles spend substantial periods of time at or near the sea surface, exposure may be avoided to some degree if their heads are out of the water or moderated by the Lloyd Mirror Effect (Carey, 2009). This effect is produced by destructive interference between the direct path of a low-frequency sound and the sea surface reflection of that sound, and results in an area of acoustic shadowing where the sound is attenuated (much quieter) or cancelled in the top 0.5 - 2 m of the water column (Gerstein, 2002 as cited in O'Shea and Poche, 2006).

Table 75 Behavioural Threshold Levels for Individual Marine Turtles – Impulsive Noise Events

Threshold	Zones of impact – maximum horizontal distance from source to impact threshold levels	
	Criteria – RMS SPL (dB re 1µPa)	Maximum threshold distance (km)
Behavioural response	166	4.18
Behavioural disturbance	175	1.37

Impacts associated with anthropogenic activities, such as acoustic disturbance, are considered in the Recovery Plan for Marine Turtles in Australia 2017 – 2027 (Commonwealth of Australia, 2017a). Whereby, '*Management of anthropogenic activities in Biologically Important Areas to ensure that biologically important behaviour can continue'* is a requirement under this report. The OA does not overlap with any marine turtle BIA. The OA is therefore not considered to be particularly important to marine turtles.

The JASCO UAM (2023) modelling outputs indicate that some behavioural effects to marine turtles within the OA, however, this area does not represent important habitat and marine turtles are not expected to occur in the OA in high numbers. Furthermore, due to the transitory nature of the active acoustic source, whereby at a speed of 4.5 knots the Seismic Vessel will travel up to 200 km in 24 hours, any effects are expected to be minor, short-term and affect a small number of individuals likely to be present within the OA. A 100 m precautionary Shut-down Zone from the operating source will be applied to marine turtles. The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting.

Based on the available evidence, and the low numbers of marine turtles expected to occur within the OA, the residual risk of behavioural impacts to marine turtle species from underwater noise exposure during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible* x *Rare*).

7.2.2.3.6 Marine Mammals

Vessel noise has the potential to disrupt the behaviours of marine mammals, but it is challenging to dissociate the effects of shipping noise from those of the physical presence of the vessel in eliciting a behavioural response (Aguilar Soto *et al*., 2006). While behavioural responses to vessels have been observed in numerous species (for reviews see Senigaglia *et al*., 2016; Machernis *et al*., 2018); it is only recently that vessel noise has specifically been identified as a driver of such responses (e.g. Sprogis *et al*., 2020; Martin *et al*., 2022). Several studies that assess behavioural changes in response to vessel noise are discussed below indicating that responses to vessel noise vary with species and context.

Evidence of behavioural responses in humpback whales to increasing vessel noise were reported by Blair *et al.* (2016), where significant effects on foraging (such as a reduction in the number of bottom-feeding events per dive, slower descent rate and fewer side-roll feeding events per dive) corresponded with increasing ship noise and led to an overall reduction in foraging rate and efficiency. Although humpback whales showed some habituation towards vessel noise, they were unable to completely adjust to the disturbance (Blair *et al.,* 2016). Dyndo *et al*. (2015) experimentally exposed captive harbour porpoises to vessel noise and reported a high level of disturbance (porpoising away) to low levels of vessel noise.

Disturbance from vessel noise has recently been demonstrated to reduce foraging time for endangered killer whales in the Salish Sea (DFO, 2017). In response to this finding, voluntary speed reductions were trialled whereby vessel speed reductions of 2.1 – 7.7 knots (for general cargo ships and container ships respectively) resulted in noise level reductions of 5.9 – 11.5 dB, and subsequent increases in foraging time for killer whales (11.5%) (Vancouver Fraser Port Authority, 2018). This clearly demonstrates that reducing vessel speed is an effective way of reducing the underwater noise generated at the vessel source.

Nowacek *et al*., (2007) investigated the behavioural response of northern right whales following the controlled exposure of whales to various recorded sounds. While individuals reacted strongly to an alert signal, and mildly to conspecific sounds, no behavioural response was observed for vessel noise. A lack of measurable response was also found when whales were approached by a vessel (Nowacek *et al*., 2007). Similarly, no response was reported for bowhead whales in the vicinity (8-50 km) of ships in the Pacific Arctic (Martin *et al.,* 2023).

Marine mammals exhibit varying behavioural responses to underwater noise (e.g. momentary pauses in vocalisations and changes in body orientation, to changes in travel direction and behavioural avoidance) to received SPLs of 140 and 180 dB re 1 µPa and as low as 110 dB re 1 µPa in some instances (Southall *et al.* 2007; Gomez *et al*. 2016). Reported behavioural effects specifically from seismic surveys include avoidance or displacement, and changes in swimming or diving behaviour (Gordon *et al*., 2003; Miller *et al*., 2009) both of which have the potential to lead to significant reductions in sightings rates across large areas of marine ecosystem (Kavanagh *et al*., 2019). If such effects persist over prolonged periods, they have the potential to significantly increase energy expenditure, decrease foraging efficiency, disrupt group dynamics (e.g. group cohesiveness), and lower reproductive rates (Weilgart, 2007; 2013); however, such effects may also be of limited ecological consequence if they are strictly temporary (Weilgart, 2007).

Studying the behavioural effects of a MSS on marine mammals can be difficult as reactions vary depending on factors such as the species, individual, age, sex, prior experience with noise, and behavioural state (Weilgart, 2007), with studies typically focusing on opportunistic observations of surface behaviours (Verfuss *et al*., 2018). In addition, behavioural responses may be subtle and barely detectable, with the potential to incorrectly suggest an apparent tolerance (Weilgart, 2007). In open seas it is unlikely that temporary displacement would have significant energetic consequences for migrating whales, but displacement could have more significant consequences in confined waterways or for resident populations.

It has been hypothesised that an increase in surface behaviours reduces an individual's exposure to high levels of underwater noise. During such responses, animals take advantage of the 'Lloyd mirror effect' (Carey, 2009) which significantly reduces sound intensity in the upper-most part of the water column. This effect is produced by destructive interference between the direct path of a sound and the sea surface reflection of that sound, and results in an area of acoustic shadowing where the sound is attenuated (much quieter) or cancelled in the top 0.5 - 2 m of the water column (Gerstein, 2002 as cited in O'Shea and Poche, 2006).

An RMS SPL of 160 dB re 1 µPa has been identified as the level at which adverse behavioural disturbance could occur (NOAA, 2019). However, behavioural changes have been noted for some species at noise levels below this threshold. For instance, behavioural changes were observed for bowhead whales at received levels as low as 125 dB re 1 µPa (Richardson *et al*., 1995), and in other circumstances higher noise levels elicit no significant behavioural response (e.g. Moulton and Miller, 2005). The context of sound exposure plays a critical and complex role in behavioural responses in marine mammals (Gomez *et al.* 2016). For example, different species (and different individuals or groups within a species) may respond differently to varying levels of sound depending on their behaviours and motivation at the time (e.g. foraging, socialising, resting and reproduction) and other factors such as the type of sound, duration of exposure, and the suddenness of the onset of the received sound (Gomez *et al*. 2016). Currently, there are no specific received level thresholds for reliably assessing or regulating stress responses. Impact assessment is primarily focussed on responses that may impact survival, lead to significant life stage impacts or displacement from biologically important areas, so a threshold for behavioural disturbance based on cetacean avoidance reactions to seismic is more commonly adopted as a proxy for such effects (Gomez *et al*. 2016). Examples of behavioural responses to seismic survey noise are provided in the following paragraphs.

Humpback whales demonstrate variable responses to seismic noise. Malme *et al*. (1985) reported feeding humpback whales responded to levels of 150–169 dB re. 1 µPa, similarly, McCauley *et al.* (1998) observed that migrating and feeding humpback whales showed behavioural responses at SPLs of 150 – 170 dB re 1µPa. Aerial observations of migrating humpback whales off Australia's east coast were made by McCauley *et al*. (2000) before, during, and after a 3D MSS. Sightings rates were considerably higher around the seismic vessel when the source was inactive compared to operational periods, suggesting active avoidance during seismic acquisition. Transiting whales consistently undertook avoidance manoeuvres (altered course and speed) at >4 km to pass no closer than 3 km behind an operating seismic vessel, while those engaged in sedentary behaviour avoided the operating vessel at a range of 7 – 12 km (McCauley *et al*., 2000). Approach trials were also carried out using a single operating acoustic source. The mean SEL to elicit avoidance behaviour was 140 dB re 1 µPa SPL and startle responses were observed at 112 dB re 1 µ Pa SPL (McCauley *et al*., 2000). Individual whales were also observed spending extended periods in surface waters when acquisition was underway (McCauley *et al*., 2000). McCauley *et al*. (2000, 2003) note that some resting female humpback whales with calves display avoidance reactions at approximately 140 dB re 1 µPa SPL, though other cohorts reacted at higher levels (157–164 dB re 1 µPa SPL) and some males were even attracted towards the seismic source at received levels up to 179 dB re 1 µPa SPL.

While some avoidance responses of migrating humpback whales were also reported by Dunlop *et al.* (2016) off Australia's east coast, Dunlop *et al.* (2015) reported little or no behavioural response to underwater seismic noise; however the received levels in this study were low (close to background levels up to 156 dB re 1 µPa), hence they may not have been high enough to elicit a detectable response (Dunlop *et al*., 2015). McCauley *et al*. (2000) hypothesised that actively migrating humpback whales are less sensitive to seismic survey noise and were at a low risk of ecologically meaningful disturbance. Conversely, whales engaging in resting behaviours at key habitats (e.g. resting grounds), and cow-calf pairs were particularly sensitive to disturbance from underwater noise (McCauley *et al*., 2000). On this basis, the context of exposure is important as animals engaged in certain behaviours may be at greater risk of disturbance than others (Gomez *et al*., 2016).

Further quantification of migrating humpback whale response to seismic survey noise was undertaken by Dunlop *et al.,* (2017) who focussed on changes to dive times, respiration rates, surface behaviours, and group movements. During this study 'typical' behaviours (such as singing, surface slapping, conspecific socialising and southward migratory travel) continued, suggesting that survey noise had little impact on typical behaviours and there was no evidence the whales were under significant additional stress. While some minor and temporary behavioural changes were observed, these were within the normal behavioural repertoire of migrating groups. Most noteworthy was that migratory progress was slower when whales were exposed to survey noise, although this reflected deviance from course as opposed to reduction in swimming speed. The reported deviations were typically short term and localised. The average deviation from the operating sound source was approximately 500 m, only 100 m (±75 m) further from the sound source than when whales were observed avoiding the vessel without the seismic source operating (Dunlop et al., 2017; Gisiner, 2017). Maximum deviations were 1,500 m to 1,800 m; however, this larger deviation involved the group of whales approaching the source (potentially out of curiosity), not avoiding it, and therefore, a reported change in movement behaviour did not necessarily result in avoidance of the source (Dunlop *et al.*, 2017; Gisiner, 2017). Such small and inconsistent deviations are generally insignificant within the larger context of a migration that occurs over months and thousands of kilometres (Gisiner, 2017). Dunlop *et al.* (2017) also noted that migrating whales are only likely to be exposed to a seismic survey for a short period of time before moving away as part of their migration. Dunlop *et al.* (2017) observed that changes in movement behaviour are likely to occur within 4 km from the Seismic Vessel at received levels over 135 dB re 1 µPa. Clear course changes of migrating humpback whales were observed by Dunlop *et al.* (2017) at received levels of 144 – 151 dB re 1 µPa.

The sensitivity of blue whales to seismic surveys remains somewhat unclear, but Gordon *et al.* (2003) suggests that blue whales may be more sensitive to seismic surveys than other baleen whales. This hypothesis is based on the response of a single tagged whale in the vicinity of active seismic operations as reported by McDonald *et al.* (1995) to describe a long-range avoidance response. In this instance, data from an array of seismometers mounted on the seafloor was analysed during a seismic survey (using a source array with a total capacity of 1,600 cui and a source level of 215 dB PK-PK over a 10- 60 Hz band). This study detailed the whale starting its call sequence when the survey vessel was 15 km distant. As the whale approached it stopped calling at a range of 10 km from the survey vessel. The received sound level at the whale's closest position was 143 dB PK-PK. After a gap in the call sequence, a new call series was located 10 km from the ship, suggesting it had tracked parallel to the ship and then moving diagonally away whereby the whale's track altered by c. 120° from its original course (McDonald *et al.*, 1995). Morrice *et al.*, (2004) (as cited in APPEA, 2013) undertook a series of aerial surveys in conjunction with a seismic survey along the shelf and shelf-break areas of Port Lincoln and Kangaroo Island in December 2003. Throughout this project 152 sightings of PBWs were made over a total survey area of 5,700 NM. Many observations of feeding behaviour were made, and, at their closest point, PBWs were reported within approximately 2.4 km of the active seismic source. Cow and calf pairs, which are considered the most sensitive of whale aggregations, were recorded within 7.1 km. Morrice *et al.* (2004) stress that the proximity of whales to seismic operations must be interpreted in the context of their pressing need to consume tonnes of food per day, i.e. PBWs may need to feed into their zone of acoustic discomfort if the only krill available is in proximity to a seismic vessel.

Avoidance behaviours of minke, sei and fin whales have also been reported by Stone (2003) who analysed cetacean sighting reports from Seismic Vessels in UK waters between 1998 – 2003. This analysis revealed that ranges of minke, sei and fin whales to seismic operations were significantly greater for sightings made during active acquisition than at other times. Avoidance behaviours have also been reported for fin whales by Castellote *et al.* (2012) who observed substantial displacement from an active seismic source which persisted well beyond the duration of the survey.

Reported behavioural responses of sperm whales to seismic surveys are variable. Mate *et al*. (1994) observed a significant decrease in sperm whale abundance in the Gulf of Mexico during seismic operations, with the closest whales observed at least 50 km away from an active seismic survey. However, the findings of several other studies differ substantially as follows:

- Madsen *et al*. (2002) reported that sperm whales exposed to sound pressures of 124 dB re 1 µPa did not change behaviours or avoid seismic surveys; rather, whales reportedly remained in the survey area for at least 13 days of exposure;
- Weir (2008) reported that encounter rates did not differ with operational status of an acoustic source, and although the mean distance to initial sighting was greater during full-scale acquisition, this effect was not statistically significant;
- Stone and Tasker (2006) reviewed data from of over 200 seismic surveys in UK waters and detected no statistically significant behavioural effects of seismic activity on sperm whales;
- Jochens *et al.* (2016) report on a sperm whale tagging study in the Gulf of Mexico from 2000 to 2003. Eight sperm whales were tagged and tracked before, during, and after playback of seismic noise. All whales maintained their course of travel and did not avoid the simulated seismic noise; however, two whales showed dive changes indicative of avoidance by deep-diving during full-array exposure, and all whales responded in a fashion expected to result in reduced energetic expenditure (i.e. lowered number of pitching movements); evidence of an effect on foraging behaviour. There was no obvious distance response to play-back pulses at a range of 20 km (Jochens *et al*., 2016); and
- Winsor *et al*. (2017) monitored sperm whale distribution by satellite tag (n = 51 tagged whales) in relation to seismic survey activity in the Gulf of Mexico. Statistical analysis to determine if whale distribution varied from that expected under spatially random conditions concluded that there was no evidence of horizontal avoidance.

Changes in dolphin behaviour were assessed during a seismic survey in the North Atlantic Ocean by Moulton and Miller (2005). Several species (common, Risso's, striped and spotted dolphins) were consistently observed when acoustic sources were active; however, some minor avoidance behaviours were noted whereby distance to initial sighting was smaller when the acoustic source was inactive. Bow-riding of the seismic vessel was also observed (at 350 m from the active source) as was feeding during acquisition periods. Moulton and Miller (2005) estimated that dolphins were subject to sound levels exceeding 180 dB re 1 µPa (rms) within 700 m of the active source. In contrast, Stone and Tasker (2006) reported that dolphins exhibit greater horizontal avoidance of seismic operations than baleen whales, killer whales, and pilot whales. However, it is generally accepted that dolphins are less likely to be disturbed by seismic operations (and are less vulnerable to acoustic trauma) than baleen and larger toothed whales, as the frequency of noise generated by seismic operations is substantially lower than the high frequency hearing sensitivities of most dolphin species. This view is clearly stated in Policy Statement 2.1.

Significant behavioural effects on harbour porpoises have been reported by Thompson *et al*. (2013), noting that the hearing sensitivity of porpoises occurs in a higher range (VHF) than that of most dolphins (HF) (Southall *et al.,* 2019). Thompson *et al.* (2013) reported that harbour porpoises were displaced from an active 470 in^3 acoustic source array over ranges of 5 – 10 km during a 2D seismic survey (received SPLs of 165 – 175 dB re 1 µPa and SELs of 145 – 151 dB re 1 µPa s^{-1}) but displaced animals returned to the acquisition area within a few hours of seismic operations ceasing (Thompson *et al*., 2013). Thompson *et al*. (2013) concluded that prolonged exposure to underwater noise from seismic surveys did not lead to significant broad-scale displacement of this species. It is noteworthy that the acoustic source reported by Thompson *et al*. (2013) was substantially smaller than that proposed for the Otway Basin 3D MC MSS.

For larger odontocetes, Stone and Tasker (2006) made the following observations:

- Killer whales showed some spatial avoidance around seismic operations, remaining further from an active acoustic source, than an inactive one, although no reduction in sighting rate in response to an active source was observed; and
- Pilot whales also showed little response to an active acoustic source; the only observed effect being a change in orientation with more movements away from, and fewer movements towards an active source.

Because beaked whales are difficult to observe at sea, the behavioural effects of seismic surveys on this group are largely unknown, but beaked whales are believed to be particularly sensitive to anthropogenic underwater noise. Research to date has focussed on responses to mid-frequency active sonar which has been implicated in multiple stranding events (Simonis *et al*., 2020). In addition, behavioural responses of beaked whales to underwater noise include increased swim speed, and unusual dive behaviours (Stimpert *et al*., 2014). Although the sound source generated by sonar is substantially different to that of seismic surveys, in the absence of specific data on the effects of seismic surveys on beaked whales, their responses to sonar are informative in a broad sense.

Based on the available information, temporary avoidance is clearly the most widely reported behavioural response to seismic surveys (Stone and Tasker, 2006). As the distribution of marine mammals is typically closely linked to that of their prey, avoidance behaviours could lead to abandonment of valuable feeding grounds (e.g. large aggregations of krill or fish) or reduced foraging effort. Seismic operations can also cause changes in abundance and distribution of prey (e.g. fish; Pearson *et al*., 1992; McCauley *et al*., 2000; Colman *et al*., 2008; Handegard *et al*., 2013, and zooplankton; McCauley *et al*., 2017) and lead to indirect effects (such as decreased foraging efficiency, higher energetic demands, lower group cohesion, higher predation rates and decreased reproduction rates) in marine mammals (Weilgart, 2007; Simmonds *et al*., 2004). Indirect effects are much more difficult to detect and measure than direct effects; however, they too are likely to vary with species, individuals, age, sex, past exposure, and behavioural state (IWC, 2007). **Section 7.2.2.2.1** provides more detail regarding the predicted effects of acoustic disturbance on the abundance and distribution of zooplankton, and implications for foraging baleen whales.

Overall, it is expected that marine mammals will elicit some behavioural responses during the Otway Basin 3D MC MSS, indeed (and as stated in Policy Statement 2.1) avoidance serves a protective role and is relied upon as a form of mitigation to prevent acoustic injury. The discussion above highlights that behavioural impacts are generally greater for baleen whales than odontocetes and on this basis, particular attention must be afforded to ensure adverse effects on threatened baleen whales are sufficiently managed by control measures. Species that are reliant on biologically important habitat in the vicinity of the OA (e.g. PBW and SRW) are of greatest potential concern. Noting that the BW Conservation Management Plan requires that marine activities must be managed in such a way that no blue whale will be displaced from a foraging area.

The underwater noise level at which behavioural disturbance is predicted for most marine mammal species is SPL 160 dB re 1 µPa (NOAA, 2019) (**Table 76**). However, behavioural effects resulting from seismic operations have been documented in some species at levels lower than this (see McCauley *et al*., 2000; Dunlop *et al*., 2017; 2017a; McDonald *et al*., 1995) indicating substantial variance in behavioural response between species, individuals, and sound levels. It is also noteworthy that severe behavioural responses are not consistently associated with higher source levels but are often influenced by context as well (i.e. by what behaviour an individual is engaged in) (Gomez *et al*., 2016; Pirotta *et al*., 2021). The NOAA (2019) 160 dB re 1 µPa SPL threshold is selected for this impact assessment as the level at which some biologically significant behavioural responses and avoidance may occur, such as avoidance by foraging, migrating and transient animals. This is broadly representative of the majority of observations reported in the literature cited above. In the risk assessment, the threshold has been applied to unweighted sound levels, as per NOAA (2019), but the acoustic modelling commissioned by TGS has also considered response levels weighted according to the LF cetacean functional hearing group, which is more biologically relevant to key species in the Otway region such as blue whales and southern right whales. More recently, Southall *et al.* (2021) provided recommendations and discussed nuances of assessing behavioural response but did not recommend new numerical thresholds for onset of behavioural responses for marine mammals due to the highly subjective and context-specific nature of the matter.

For the purpose of the Otway Basin 3D MC MSS, UAM was used to predict the maximum distance from the active acoustic source that this threshold is reached over several areas within or relevant to the OA (**Table 76**).

Table 76 Behavioural Response Threshold and Predicted Onset Distances for Marine Mammals

Marine mammal hearing group	Zones of impact – maximum horizontal distance from source to impact threshold levels		
	Criteria - SPL (dB re 1µPa)	Water Depth (m)	Range of maximum threshold distance (km)
All hearing groups	160	all	4.45 – 12.2

Animat modelling was undertaken to specifically assess the potential behavioural impacts on PBWs (males and females) and SRWs (both mothers with calves and unaccompanied adults) for the scenarios described in **Section 7.2.2.2.7**. Recognising that SRWs aggregate off the coast of Portland, Port Fairy and Warrnambool to calve, mate and rest, this EP has adopted a more precautionary impact threshold for these key life stages. The more precautionary weighted SPL criteria of 140 dB re 1 µPa, consistent with Wood *et al*. (2012) has been applied for the evaluation of potential impacts to SRW mother-calf pairs associated with the Aggregation BIA. This is considered representative of a potential avoidance response by LF cetacean mother-calf pairs given that other LF mother-calf pairs (i.e. humpback whale) were observed by McCauley *et al.* (2000, 2003) to display avoidance reactions at received SPLs of 140 dB re 1 µPa from seismic impulses while other cohorts reacted at higher levels (157– 164 dB re 1 µPa). The results of the Animat modelling are presented in **Table 77** and **Table 78**.

Table 77 Predicted Animat Behavioural Impact Onset Distances for Pygmy Blue Whales

Threshold		Scenario 1a				Scenario 1b			
		Female		Male		Female		Male	
	dB	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)
Behavioural response (SPL)	160	6.05	83	6.21	80	7.01	41	6.82	51

Table 78 Predicted Animat Behavioural Impact Onset Distances for Southern Right Whales

Threshold		Scenario 2a				Scenario 2b			
		Mother & Calf		No calf		Mother & Calf		No calf	
	dB	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)	ER95% (km)	P_{exp} (%)
Behavioural response (SPL unweighted)	160	-	-	-	-	6.10	73	6.06	76
Behavioural response (SPL weighted)	160	-	-	NA	NA	0.59	59	NA	NA
Behavioural response (SPL weighted)	140	31.5	61	NA	NA	30.0	81	NA	NA

Dashes indicate no simulated whales were exposed above threshold.

Summary of modelling results relevant to behavioural thresholds for marine mammals

The key results for behavioural effects as predicted from both the UAM and the animat modelling can be summarised as follows:

- For all marine mammal hearing groups (cetaceans and otariid seals), the UAM results predict that the behavioural response onset distance will occur between 4.45 and 12.2 km from the acoustic source (**Table 76**).
- For PBW, animat modelling predicts that in the offshore direction, the maximum range to the behavioural response onset threshold is approximately 6.2 km (Scenario 1a, **Table 77**) and in the inshore direction the maximum range is slightly greater, approximately 7 km (Scenario 1b, **Table 77**).
- Animat modelling results are particularly valuable in assessing the potential behavioural effects on SRWs, and the modelling specifically considers mother-calf pairs in the Aggregation BIA, as well as the connecting habitat, migration and resting on migration BIAs in coastal waters. Based on the animat results and the weighted 140 dB re 1 µPa SPL behavioural response threshold for mother calf pairs, behavioural effects could occur up to approximately 32 km from the seismic source on the continental shelf (**Table 78**). Further to this, Welch *et al.* (2023) report that the maximum weighted received SPL in the closest part of the Aggregation BIA (Area 1) is 141.5 dB re 1 µPa (see Table 35 of **Appendix B**). The maximum weighted received SPLs in the migration and resting on migration BIAs to the east and west of the Aggregation BIA are below 140 dB re 1 µPa SPL (see Table 35 of **Appendix B**).
- Regarding SRWs and for additional context, the unweighted equivalent of the 140 dB re 1 µPa SPL taken from the UAM results shows that levels may be exceeded approximately 42 km inshore of modelling sites closest to the Aggregation BIA (see Site 1 in Table 13 of **Appendix B**) and the unweighted received SPL in the closest part of the Aggregation BIA is approximately 144 dB re 1 µPa (see Area 1 in Table 35 of **Appendix B**).

- Using the combined UAM and animat modelling results as described for SRWs above, it is evident that if acquisition occurs on the upper continental shelf offshore from the Aggregation BIA, received levels within the outer limits of the BIA may exceed the weighted 140 dB re 1 µPa SPL behavioural response threshold for mother calf pairs, but that further inshore, this threshold will not be exceeded.

The model results can also be used to assess the potential impact of 2D tie line acquisition on marine mammals. This tie line extends onto the continental shelf and is oriented perpendicular to the bathymetric contours and shelf edge. This orientation results in the lower end-fire propagation ranges being directed towards coastal waters and, in particular, the SRW Aggregation BIA (Welch *et al.*, 2023). The tie line will involve only a few hours of acquisition on the continental shelf and the modelling demonstrates that unweighted SPLs received in the SRW BIAs will be approaching or below 140 dB re 1 µPa SPL. Weighted SPLs will be even lower. Therefore, no significant behavioural disturbance to mother-calf pairs is expected from acquisition of the 2D tie line.

General Controls to Address Potential Behavioural Effects

A comprehensive suite of survey design features, mitigations and management procedures are being proposed to minimise potential behavioural impacts to an **Acceptable Level**. A consolidated description of all controls is provided as **Appendix M**, and individual controls are discussed in **Table 85**.

On account of the Otway Basin 3D MC MSS having a 'high likelihood' of encountering whales, and the OA overlapping/approaching biologically important habitat, both standard management procedures (in accordance with Policy Statement 2.1) and additional management procedures are necessary to ensure that potential impacts on marine mammals are sufficiently addressed. The general Management Procedures (**MP 1 – 10**) will be implemented and will afford protection to all marine mammal species and ensure consistency with the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered). In addition, the following additional management procedures (**AMP**s) will apply to all operations:

- AMP 1: Soft start procedures throughout the OA can only proceed under the following circumstances:
  a. If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone[AC];
  b. If acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.
- AMP 2: 2D tie line acquisition inside any BIA/buffer will only be permitted to occur in daylight hours, and two MFOs must be on duty on the Seismic Vessel and two MFOs must be on-duty on the Attending Support Vessel. 2D tie line acquisition inside any BIA/buffer can occur at any time providing the following criteria are met:
  a. An aerial survey has been conducted within 4 days of such operations commencing and no baleen whales have been detected. This aerial survey must focus on the area of planned acquisition that overlaps the BIA/buffer and must extend to at least 42 km on either side of the planned 2D sail line;
  b. 2D tie line acquisition inside any BIA/buffer must not occur for more than 12 hours total within any 24 hour period;
  c. The Extended Observation Zone as described in BMP 4 is implemented; and
  d. The acoustic source must not be active for more than a combined total of 20 hours (maximum) in the BIAs/buffers.

- AMP 3: Marine mammal observations made during the Otway Basin 3D MC MSS will be undertaken by dedicated, trained and experienced MFOs. All MFOs must have proven 'at sea' experience in whale identification and behaviour, and distance estimation, and must be confident in the identification of those species that the EP predicts will be present in the OA. All MFOs will hold a JNCC Marine Mammal Observation certification (or equivalent). In addition, the lead MFO on the Seismic Vessel must have logged a minimum of 20 weeks' relevant sea-time engaged in marine seismic survey operations in Australian waters as an MFO.
- AMP 4: A minimum of two MFOs will be onboard the Seismic Vessel for the duration of the Otway Basin 3D MC MSS and two additional MFOs will be stationed on the Attending Support Vessel.
- AMP 5: A passive acoustic monitoring (**PAM**) system will run 24 hours per day on the Seismic Vessel during the Otway Basin 3D MC MSS, with dedicated, trained and experienced PAM Operators conducting acoustic monitoring for the presence of cetaceans[27] while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedure.
- AMP 6: At least two dedicated, trained and experienced PAM Operators will be on the Seismic Vessel for the duration of the survey, with at least one PAM Operator maintaining 'acoustic watch' at all times while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedure.
- AMP 7: The lead PAM Operator must have logged a minimum of 20 weeks' relevant sea-time engaged in seismic survey operations in Australian waters as a PAM Operator. All PAM Operators will need to be able to demonstrate competency in the acoustic identification of the species that are likely to be present during the Otway Basin 3D MC MSS, and in interpreting acoustic software and estimating distance to any detected whale calls.
- AMP 8: A full replacement PAM system will be kept onboard the Seismic Vessel and will be used as a back-up if the PAM system malfunctions and is unable to be repaired.
- AMP 9: In the event that the PAM system malfunctions or becomes damaged, seismic operations may continue for 20 minutes without PAM while the PAM Operator diagnoses the issue. If it is found that the PAM system needs to be repaired or replaced, seismic operations may continue for an additional two hours without operational PAM as long as: a) it is daylight hours and the sea state is less than or equal to Beaufort 4, b) no whales were detected solely by PAM in the relevant mitigation zones in the previous two hours; c) two MFOs maintain watch at all times during seismic operations when PAM is not operational, d) seismic operations with an active source, but without an active PAM system, do not exceed a cumulative total of four hours in any 24-hour period.
- AMP 10: The PAM system will be programmed to receive/recognise vocalisations of whales within the frequencies 10 Hz to 200 Hz. The frequency range will theoretically be tuned to detect both low frequency vocalisations of baleen whales and the high frequency echolocations of sperm whales.
- AMP 11: PAMGuard software will be incorporated into the PAM system to assist with locating and classifying the vocalisations of marine mammals, and the PAM Operators will be suitably trained in using the PAMGuard software.

[27] PAM is not considered to be a particularly reliable method for detecting low-frequency cetaceans. On this basis, management measures for baleen whales have been developed to remove the reliance on PAM while still maintaining a high level of protection.

While species specific controls are outlined presently for blue whales and southern right whales, several adaptive management procedures (**ADMP**s) will be followed for 'other whales' throughout the entire OA for the duration of the Otway Basin 3D MC MSS, noting that the maximum onset distance predicted by UAM for behavioural effects was c. 12 km for all species.

- ADMP 1: If three or more 'other whale' instigated shut-downs occur within a 24-hour period, the Seismic Vessel will relocate at least 12 km in the direction away from the sightings before commencing Pre Start-up Visual Observations and Soft Start Procedures[28].
- ADMP 2: If an 'other whale' mother and calf pair is observed within 12 km[29] of the active acoustic source during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut down and the Seismic Vessel will relocate to another area at least 12 km away from the last recorded position of the mother-calf pair before commencing Pre Start-up Visual Observations and Soft Start Procedures[30].

Specific Controls for Blue Whales

For PBWs, the maximum predicted onset distance for TTS is approximately 32 km (see **Table 71**) which exceeds the distance over which biologically significant behavioural avoidance and disruption to foraging behaviours are expected (6 – 7 km). On this basis the controls for BW/PBWs are largely underpinned by the predicted onset distances for TTS and are discussed at length in **Section 7.2.2.2.7**. The maximum predicted onset distance for behavioural effects for BW/PBW is 7 km. This distance directly informs the 7 km Extended Shut-down Zone for BW/PBW. Fundamental to managing the potential behavioural effects on foraging BW/PBWs is the proposed implementation of a spatio-temporal exclusion, whereby seismic operations will not be permitted within 16 km of any BW BIA during the months of January to June.

Specific Controls for Southern Right Whales

Animat modelling has been used to inform the development of the following control measures for SRWs. This modelling predicts the maximum onset distances for 24 hour cumulative PTS and TTS as 40 m and 11 km respectively. Based on these results, TTS effects are not predicted to extend from the OA into the Aggregation BIA (which occurs 14 km north of the OA) or any of the connecting habitat, migration and resting on migration BIAs that occur further afield in coastal waters. The predicted onset distance for behavioural effects for SRWs were assessed separately for 'mother-calf pairs' and 'other individuals' as 31.5 km and 6.1 km respectively. In keeping with the Shut-down Zone with BW/PBW, 7 km has been selected as the Shut-down Zone for SRW, to conservatively address the maximum predicted onset distance of 6.1 km for behavioural effects on individual (i.e. unaccompanied) SRWs. In addition to the Animat modelling and using a very conservative interpretation of the maximum-over-depth acoustic modelling results, behavioural effects to mother-calf pairs may indeed occur up to 42 km inshore of acquisition when it occurs closest to the Aggregation BIA.

[28] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.
[29] Note that the intention here is not to provide full MFO coverage of this zone, but to opportunistically respond to any mother-calf sightings that are detected within a 12 km radius. If the sighting occurs outside 12 km (i.e., during aerial surveys or support vessels en-route to resupply) no action will be required.
[30] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.

The operative SRW Conservation Management Plan (CoA, 2012) states that "*Noise interference is of particular concern within or close to southern right whale aggregation areas where young calves are present and whales are resident for long periods of time*"; hence the measures described below are targeted to address these specific noise impacts. While there is another designated 'known core range' BIA in the area, the OA only marginally overlaps with this, and the expectation is that animals traverse this area on their way to and from the more coastal aggregation areas and connecting habitat. Strong adaptive management measures have been developed to address potential noise effects in the wider area.

The 42 km onset distance for behavioural impacts to mother-calf pairs has been used to define a buffer zone around the SRW Aggregation BIA (referred to as the **SRW Ag BIA** herein). No acquisition will occur within the SRW Ag BIA or the 42 km buffer during the core aggregation months of May to September (SWIFFT, 2023). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2** in **Appendix M**) and will only take approximately 12 hours to acquire.

This spatio-temporal measure has been designed to eliminate any physiological or behavioural effects on SRWs in the SRW Ag BIA during the months over which SRWs are expected to be present. On this basis, compliance with Interim Recovery Objective 5 of the operative Southern Right Whale Conservation Management Plan that anthropogenic threats are demonstrably minimised, is achieved. This control also aligns with the recommendation in Policy Statement 2.1 that seismic surveys should be undertaken outside of biologically important areas at biologically important times.

While the Draft National Recovery Plan for the Southern Right Whale (CoA, 2022) is not yet operative, once finalised it will supersede the current operative plan. The conservation actions included in the draft plan that are of relevance to seismic survey noise are listed in **Table 80** along with how they are addressed by the proposed controls. TGS is aware that the designated BIAs are also being reviewed as part of the process underpinning the review of the recovery plan. There is a strong possibility that the BIA boundaries for SRWs will change prior to the commencement of the proposed survey. TGS can confirm that the 42 km buffer as described above will be applied to the updated aggregation/reproductive BIA should it be published before the survey commences.

Table 79 Assessment of proposed controls against the draft conservation actions outlined in the Draft National Recovery Plan for Southern Right Whales (CoA, 2022)

Draft Actions of Relevance to Anthropogenic Underwater Noise (Action Area A5)	How Addressed by the Proposed Controls
Improve baseline understanding of SRW acoustic communication to better assess potential impacts from anthropogenic underwater noise.	The EP relies on the best available data as included in the Animat modelling undertaken by JASCO regarding SRW behaviour and acoustic communication.
Actions within and adjacent to SRW BIAs and 'Habitat Critical to Survival' should demonstrate that it does not prevent any SRW from utilising the area or cause injury (TTS and PTS) and/or disturbance.	The proposed 7 km Shut-down Zone prevents all PTS and single pulse TTS. Noting that cumulative TTS is predicted only if a SRW remained within 11 km of the active source for 24 hours. However, the vessel movement (average 8 km/hr) means that in practice TTS is unlikely as the vessel would be well beyond the TTS onset distances within 2 hours (i.e. much shorter than the 24 hrs of exposure needed to induce TTS). The 7 km Shut-down Zone protects all unaccompanied SRWs against behavioural effects (which are predicted to only occur to 6.1 km) and the 42 km buffer around the SRW Ag BIA protect mother calf pairs from behavioural disturbance. In addition, if a mother calf pair is detected outside the SRW Ag BIA/buffer (which could occur as they move south at the end of the breeding season), a shut-down will be triggered at any distance to prevent disturbance. In addition, no acquisition will occur within the SRW Ag BIA or the 42 km buffer during the core aggregation months of May to September.
Ensure environmental assessments associated with underwater noise generating activities include consideration of national policy (e.g. Policy Statement 2.1) and guidelines related to managing anthropogenic underwater noise and implement appropriate mitigation measures to reduce risks to SRWs to the lowest possible level.	The EP contains a comprehensive assessment of the potential effects of underwater noise on SRWs. The survey adopts Policy Statement 2.1 and oftentimes exceeds the requirements of this policy statement to ensure that the risks to SRWs are reduced to the lowest possible level.
Quantify risks of anthropogenic underwater noise to SRWs, including behavioural disturbance, changes to vocalisations, and physiological effects to whales.	The EP contains a comprehensive assessment of the potential effects of underwater noise on SRWs, and Animat modelling has been conducted to specifically quantify the risks of underwater noise.
Prioritise government/industry funding opportunities to support research to identify short and long-term responses of SRWs to underwater noise.	TGS is in dialogue with Blue Whale Study regarding the implementation of aerial surveys during the proposed seismic survey.
Improve understanding and characterisation of marine soundscapes, including the application of new technologies for data processing, within Southern Right Whale BIAs to facilitate quantification of anthropogenic noise in the marine soundscape.	Animat modelling has been conducted to specifically quantify the risks of underwater noise. In particular, two scenarios were modelled, one of which was specifically tailored to assess the effects of underwater noise in the SRW Ag BIA. The model was run for both mother-calf pairs and all other cohorts of unaccompanied SRWs.

The modelling took a conservative approach, whereby 1) the worst-case scenarios for noise propagation were modelled to produce maximum estimates of onset distances for TTS, PTS and behavioural effects, and 2) the modelled source locations and inputs were those expected to exhibit noise propagation over the greatest distances.

Operations inside the SRW Ag BIA and the 42 km buffer (referred collectively as **SRW Ag BIA/buffer** herein) will be permitted outside these months including during the aggregation shoulder months of April and October. All operations inside the SRW Ag BIA/buffer during the shoulder months will be subject to the use of aerial surveys to assist with SRW detection.

Throughout the survey an Extended Observation Zone (as described in **SRMP 4** below) will be implemented and will serve the dual purpose of detecting SRWs at extended distances in order to implement the 7 km Extended Shut-down Zone and to assist with survey planning in order to facilitate operational avoidance of areas where SRWs are present. Several adaptive management measures are also proposed.

In light of the conservative approach taken by the modelling, the proposed controls (as summarised above and detailed below) demonstrate consistency with the objective of the SRW Conservation Management Plan (that anthropogenic threats are demonstrably minimised) and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered).

The adoption of the controls summarised above and detailed in the specific control measures below ensures that the protection afforded to SRWs, both inside the SRW Ag BIA and outside, is very strong and that the risks to SRWs are reduced to the lowest possible level.

The following additional and adaptive management procedures for SRW (denoted with **SRMP**) will be implemented during the Seismic Survey:

- <u>SRMP 1:</u> A 42 km buffer will be established around the SRW Ag BIA where it approaches the OA.
- <u>SRMP 2:</u> The Seismic Vessel will not activate the acoustic source(s) within the SRW Ag BIA/buffer from May to September (inclusive) which represents the core aggregation months during which SRWs are expected to be present here. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2** in **Appendix M**.
- <u>SRMP 3</u>: A 7 km Extended Shut-down Zone will be implemented for SRWs throughout the OA (including the SRW Ag BIA/buffer). On this basis a Low Power Zone is deemed unnecessary.
- <u>SRMP 4</u>: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for SRWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5 – 7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5 – 7 km ahead of the seismic vessel to assist with SRW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met:
    a. The MFO onboard the EOZ Support Vessel continues observations for SRWs;
    b. There have been no SRW instigated shut-downs in the preceding 6 hours; and

c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel.

- SRMP 5: Low Visibility or Night-time Operations may occur provided that no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).
- SRMP 6: During April and October (shoulder aggregation months) the Seismic Vessel is permitted to operate in the SRW Ag BIA/buffer in accordance with the following protocols:

a. All reasonable efforts will be made to ensure aerial surveys will be conducted to assist with the detection of SRWs in the SRW Ag BIA/buffer during April and October. Within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer, aerial surveys will be flown, if possible, to identify any SRW that may be present. Any such detections will result in acquisition within the SRW Ag BIA/buffer being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of SRWs in the SRW Ag BIA/buffer by relocating to parts of the OA where potential impacts on SRWs are less likely.

b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night-time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.

c. Aerial survey efforts will concentrate on the area of the SRW Ag BIA/buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Aerial surveys should also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs and to redirect seismic survey efforts in order to avoid areas where SRWs are present.

d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW from the air.

e. Start-up (via soft start) can only commence in the SRW Ag BIA/buffer during April and October if the following criteria are met:

i. A minimum of two hours of daylight remain before nightfall;

ii. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone;

iii. A Support Vessel is available to undertake the requisite marine mammal monitoring;

iv. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no SRWs have been sighted; and

v. The start-up location does not occur within 42 km of an area where a SRW detection has been made in the last four days.

- SRMP 7: If a SRW is detected in the 7 km Extended Shut-down Zone during the Otway Basin 3D MC MSS the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 11 km away from the last SRW (unaccompanied) sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. Note that this distance increases if a calf is present in accordance with **SRMP 10**. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.
- SRMP 8: A Start-up Delay will occur if a SRW enters or is detected in the 7 km Extended Shut-down Zone during soft start, and soft start procedures may only resume once the SRW is observed to move outside this Shut-down Zone or 30 minutes have lapsed since the last SRW sighting.
- SRMP 9: If higher than anticipated numbers of SRW are observed (three or more SRW instigated shut-downs are made during the preceding 48 hour period[31]) at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply:
    a. Acquisition in the SRW Ag BIA/buffer must cease
    b. Low Visibility or Night-time Operations must cease;
    c. The acoustic source will be shut-down and the Seismic Vessel will relocate to another area at least 42 km away from the last SRW sighting, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone; and
    d. Normal operations may only resume after 24 hours of no SRW instigated shut-downs.
- SRMP 10: If a SRW mother and calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.

7.2.2.3.6.1 Assessment Summary – Behavioural Effects on Blue Whales

Dedicated, trained, and experienced MFOs will be on watch at all times during daylight hours to monitor for marine mammals. The 7 km Extended Shut-down Zone for BW/PBWs provides excellent protection from behavioural disturbance, and the 16 km buffer zone around the BW BIAs and associated spatio-temporal controls well exceeds the predicted onset distance for behavioural impacts (which according to animat results could occur out to c. 7 km for this species). On this basis, full protection against significant behavioural disturbance for BW/PBWs is provided.

TGS will also implement both spatial and temporal exclusions to minimise the potential effects of underwater survey noise on foraging whales. No acquisition will occur within the BW BIAs or the 16 km buffer during the 'peak feeding season' from January to June (inclusive) based on the expected consistent and widespread presence of whales in the foraging areas during these months (Gill *et al.*, 2011; 2015; McCauley *et al.*, 2018). This spatio-temporal control represents best international practise for minimising noise disturbance in areas of high density and biological importance during key periods (following Chou *et al.*, 2021). The only exception permitted will be the acquisition of the 2D tie line which will be subject to additional operational restrictions and will only take approximately 12 hours to acquire.

[31] Note that any unidentified whale/s will contribute to this count.

These proposed control measures for BW/PBW have been designed to eliminate any behavioural effects on foraging BW/PBWs throughout the OA and to provide a very high level of protection to foraging whales in the BW BIAs during the peak foraging season; hence, to comply with the requirement of the BW Conservation Management Plan that no blue whale will be displaced from a foraging area.

It is therefore considered that the Otway Basin 3D MC MSS can operate in accordance with the requirements of the BW Conservation Management Plan by ensuring the continuation of biologically important behaviours and that residual environmental impacts and risks of the proposed Otway Basin 3D MC MSS on blue whales are managed to an **Acceptable Level**.

7.2.2.3.6.2 Assessment Summary – Behavioural Effects on Southern Right Whales

SRWs aggregate seasonally in coastal waters to rest, calve and breed, and the OA is largely situated beyond continental shelf waters, hence the potential for behavioural effects on SRWs is limited. Indeed, modelling results indicate that the shelf break is reasonably effective at restricting sound propagation towards sensitive coastal SRW habitat. However, if acquisition occurs on the upper continental shelf and in the vicinity of the Aggregation BIA, received levels on the offshore boundary of the BIA may exceed the weighted 140 dB re 1 µPa SPL behavioural response threshold for mother-calf pairs.

To manage the potential for behavioural disturbance to SRWs (in particular mother-calf pairs) in the SRW Ag BIA during the Otway Basin 3D MC MSS, acquisition will not be permitted within 42 km of this BIA during the core aggregation months of May to September, and aerial surveys will be required to increase the detection rates of SRWs within the 42 km buffer during the shoulder months of April and October. In addition, a 7 km Extended Shut-down Zone will be implemented throughout the OA. Based on the adoption of these control measures, no significant disturbance to SRWs in the SRW Ag BIAs is predicted to occur as a result of the Otway Basin 3D MC MSS. The proposed controls also address the requirements of the Draft National Plan for the SRW (CoA, 2022) and TGS notes that if the BIA boundaries change prior to the survey commencing, the 42 km buffer will be applied to the revised aggregation/reproductive BIA.

While knowledge of SRW distribution and migration pathways outside of the SRW Ag BIA and coastal migration corridors is limited, it is generally accepted that the migration pattern of this species is typified by counter-clockwise movement, whereby animals arrive in the east of Australia in May-July, peak in coastal aggregation areas (including those inshore of the OA) during July/August and then migrate west along the coast before departing in a southward direction in Sept/Oct towards higher latitude feeding grounds (Burnell, 2001). While this suggests that significant offshore movement in the vicinity of the OA will be limited, the possibility of SRWs occurring further offshore of the SRW Ag BIA and coastal migration BIAs cannot be dismissed, including the potential for mother-calf pairs to depart the coastal aggregation areas around Portland and transit south directly through the OA at the end of the breeding season. While several of the control measures for this species are linked to the SRW Ag BIA (temporal closure and aerial surveys) the 7 km Shut-down Zone will apply irrespective of location or season for this species (for unaccompanied SRWs), and further to this, any sighting of a SRW mother-calf pair will trigger a shut-down at any distance during the Otway Basin 3D MSS and a subsequent 42 km relocation (**SRMP 10**). This control measure provides strong protection to mother-calf pairs against behavioural disturbance.

7.2.2.3.6.3 Assessment Summary – Behavioural Effects on Other Whales

Predicted onset distances to the 160 dB re 1 µPa SPL behavioural response threshold ranged from approximately 4.5 km to 12 km depending upon the water depth. These onset distances are maximum-over-depth ranges that are strongly influenced by the greater propagation distances calculated for the deep portion of the water column. In reality onset distances are likely to be smaller, particularly for those species that do not routinely utilise deep waters for foraging.

While it is possible that some short-term disturbance and temporary behavioural effects could occur for baleen whales, in the most part the presence of species other than PBWs and SRWs is not expected to be consistent and is likely to be typified by low densities of transient individuals. For this reason, temporary behavioural disturbance is not expected to result in any impacts at the population level.

For HF and VHF cetaceans, the predicted onset distances for behavioural response are also likely to be conservative as energy from the seismic source is emitted primarily at frequencies lower than the hearing range of most dolphins and toothed whales. Overall, and based on the reduced hearing sensitivity of these species to low frequency seismic survey noise, the risk to HF and VHF cetaceans is limited.

Sperm whales and beaked whales, which are known to forage at depth, may be more susceptible to acoustic impacts as there is a greater likelihood that such species will be exposed, albeit for brief periods, to the maximum-over-depth SPLs calculated for the entire water column that are of lower relevance to species that do not make deep dives. While long-term displacement of sperm whales or beaked whales from foraging habitat is not predicted, low to moderate level behaviour responses cannot be dismissed if an individual in relatively close proximity to the acoustic source encounters a deep sound channel where SPLs may increase unexpectedly. The clicks and calls of sperm whales and beaked whales are however distinctive and detectable with PAM systems, which will be used during the Otway Basin 3D MC MSS and which will trigger a shut-down within 2 km.

Generally speaking, the survey design confers a degree of mitigation against behavioural disturbance to marine mammals as the OA is located in open ocean; hence, will not impact any confined water body; and the long survey lines will ensure that the Seismic Vessel will not focus in any specific area for a long period of time or expose any marine mammals to potential cumulative effects from acoustic noise being concentrated in one location.

While the 2 km Shut-down Zone for 'other whales' may not fully protect other baleen whale and large toothed whales species from behavioural disturbance under all circumstances, it does represent a significant extension on the standard Shut-down Zone of 500 m for whales as required by Policy Statement 2.1 and on account of the low densities of whales anticipated in the OA, no detectable adverse effects to any whale populations are predicted. As Conservation Management Plans are not available for all species with a potential presence in and around the OA, the following key considerations arise:

- Behavioural responses (especially displacement) are expected for most marine mammals and serve to protect marine mammals from hearing injury;
- Most other baleen whales are probably only present in and around the OA at low or very low densities; and
- On account of their different hearing sensitivities, odontocetes are less likely to be disturbed by seismic survey noise.

7.2.2.3.6.4 Assessment Summary – Behavioural Effects on Pinnipeds

Pinnipeds are sensitive to sound in both air and water (Southall *et al.,* 2007; Finneran, 2015; 2016; NMFS, 2018; Southall *et al.,* 2019). Pinniped species that may be encountered during the Otway Basin 3D MC MSS are all otariid seals (i.e. fur seals and sea lions) and include Australian sea lions, Australian fur seals, and New Zealand fur seals.

It is noteworthy that the OA does not overlap with any identified pinniped BIAs, and while non-threatened Australian and New Zealand fur seals are expected to be encountered (particularly New Zealand fur seals that are known to forage in offshore waters; Baylis *et al*. 2008), the likelihood of encountering threatened Australian sea lions during the Otway Basin 3D MC MSS has been assessed as low (see **Section 4.5.6.3.1**).

Of all the marine mammal hearing groups, that of otariid seals is thought to be the least sensitive to underwater noise (Southall *et al*., 2019). Behavioural responses in pinnipeds occurred in response to SPLs between 165 and 195 dB re 1 µPa (Southall *et al*., 2007) and included hauling out (possibly to avoid the noise) and temporary cessation of feeding (Bohne *et al*. 1985). Despite hearing sensitivities being low for otariid seals, NOAA (2019) suggests that the same threshold level (160 dB re 1 µPa SPL for impulsive sounds) is used to assess potential behavioural impacts to otariids. Using this threshold and based on the UAM results, behavioural responses of otariid seals may occur between approximately 7 km and 12 km from the seismic source on the upper continental slope (Area 1; <~1,600 m depth; Welch *et al*., 2023). Further offshore in deeper water depths (Area 2; >~1,600 m), the ranges for behavioural disturbance are less (approximately 4.5 to 6.6 km) (Welch *et al.,* 2023). Note that these ranges are calculated as maximums over depth, therefore, the ranges in the upper water column where animals are likely to be present (noting that dives mainly occur to depths of 10 – 100 m for all species, but New Zealand fur seals have been reported diving to depths > 200 m; see **Section 4.5.6.3.3**) will be significantly less.

Lalas and McConnell (2016) investigated the response of New Zealand fur seals to a large-scale offshore 3D seismic survey and found that the source vessel and towed gear created physical obstacles that generated responses from fur seals. The authors suggested that the acoustic source noise was not the only stimulus that generated a response from seals; with noise from the vessel engines or changes in wave pattern created by the vessel or towed gear also having an influence. When awake, seals also responded to the visual stimulus of vessel presence. Overall, Lalas and McConnell (2016) concluded that the vessel and towed gear create physical obstacles that generated more pronounced avoidance responses than those attributable to underwater noise.

Australian sea lions and Australian fur seals primarily forage on the continental shelf where the predicted onset distance to behavioural response is greatest. Hence, some behavioural disturbance to individuals foraging here cannot be dismissed. However, the constant movement of the Seismic Vessel coupled with individual avoidance responses suggest that long-term or ecologically significant effects are unlikely. The foraging range of New Zealand fur seals is broader and includes shelf waters and further offshore in the subtropical convergence zone. The foraging distribution of this species is, therefore, more likely to overlap with the OA than the other otariid species, even so, and following Lalas and McConnell (2016), disturbance effects from underwater noise are expected to be minor in magnitude.

Overall, it is expected that any behavioural disturbance to pinnipeds during the Otway Basin 3D MC MSS will be minor and short term in nature, whereby interruptions to foraging or at-sea resting behaviours of exposed individuals may occur. Such effects are not expected to have significant long-term implications for any individual or population. Sound levels that may result in behavioural disturbance will not extend to coastal waters around breeding colonies.

7.2.2.3.6.5 Conclusion – Behavioural Effects on Marine Mammals

In summary, with the implementation of the extensive control measures that have been specifically developed to consider all the different marine mammal sensitivities within the OA and surrounds, the residual risk of behavioural impacts to marine mammals from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Moderate** (*Minor x Certain*) as while some avoidance behaviours are expected, no detectable adverse effects to populations are predicted.

7.2.2.3.7 Seabirds

Although there is little information about the behavioural effects of MSSs on seabirds, several authors have raised the possibility of disruption to feeding activities, with foraging seabirds that may dive beneath the surface in particular of concern with regard to acoustic emissions from the acoustic source. Only birds diving and foraging within the AA have the potential to be exposed to significantly increased sound levels generated by the operating acoustic source while diving for prey near the sea surface.

Goudie and Ankney (1986) suggested that seabird feeding behaviours could possibly be interrupted by acoustic disturbance from the Seismic Vessel passing through feeding grounds; and MacDuff-Duncan and Davies (1995) postulated that birds in the area could be alarmed as the seismic operations pass close-by, causing them to temporarily stop diving. In addition to the potential direct displacement of seabirds, the displacement of bait fish could lead to a reduction in the diving activities and foraging potential for seabirds in the immediate vicinity of the seismic operations.

Birds resting on the surface of the water in proximity to the seismic vessel have limited potential to be affected by sound emissions underwater due to the limited transmission of sound energy between the water/air interface but may also be startled by seismic pulses in close proximity to the acoustic source. However, given the likely avoidance response from fish and other prey species in waters immediately surrounding the acoustic source (see **Section 7.2.2.3.2**), birds are unlikely to forage near the operating acoustic source. In the unlikely event that birds dive and forage near the acoustic source, this is likely to only affect individual birds, resulting in a startle response with the affected birds expected to move away from the area as a result. The consequence of this is expected to be negligible and impacts at a population level are extremely unlikely to occur.

It is noted that the behaviour and distribution of some fishes may be affected for short periods during and after exposure to the acoustic source (see **Section 7.2.2.3.2**). This may result in short-term and localised changes in the distribution of target prey species; however, these effects are unlikely to be discernible to foraging birds in the context of the normal movements and variation in the distribution of fishes.

Little penguins may be more susceptible to exposure to underwater sound due to their foraging behaviours whereby penguins swim and forage beneath the sea surface. Little penguins have not been identified as potentially present within the OA but are expected to be present within the wider EMBA (see **Section 4.5.7**). Lady Julia Percy Island, approximately 50 km north of the AA, is home to around 2,000 breeding pairs of little penguins. Little penguins were found to forage in discrete areas within a maximum distance of 5.6 km to 36 km from breeding colonies (Hoskins *et al.* 2008). McCutcheon *et al*. (2011) report that during the winter non-breeding period, some individuals conduct single-day trips 8 – 14 km from the colony, while other individuals conducted longer trips of 10 – 50 days and travelled over 200 km in some instances, although these movements where alongshore and remained in continental shelf waters.

Data on the underwater hearing sensitivity of penguins is limited and there are no regulatory thresholds or criteria established to assess potential hearing impairment or behavioural responses by diving birds to underwater noise. Pichegru *et al*. (2017) assessed the foraging behaviour of African penguins before, during and after an MSS that occurred within 100 km of breeding colonies. Penguins foraging within 100 km of the active acoustic source showed a change in foraging direction, increasing the distance between feeding areas and the Seismic Vessel. Displaced penguins reverted to normal foraging behaviours following the cessation of seismic activities, suggesting effects are relatively short-lived. It is worth noting that although the Pichegru *et al*. (2017) study was unable to differentiate between penguins shifting foraging activities in direct response to the survey (i.e. behavioural effect) or indirectly due to a change in prey distribution, a behavioural response was determined as the most likely cause. While the penguins were able to locate alternative feeding grounds, the displacement from traditional grounds resulted in an increase in energy expenditure (Pichegru *et al.,* 2017).

In a controlled exposure experiment, Sørensen *et al*. (2020) exposed captive gentoo penguins (*Pygoscelis papua*) to impulsive signals, and most animals showed strong aversive reactions at received levels above 120 dB re 1 µPa (SPL). While the experiment made efforts to reduce some of the limitations of captive experiments, the study is still difficult to reconcile exposures to sudden sound stimuli at close range (metres) in the absence of natural ocean background noise with a real-life exposure.

Lacroix *et al*. (2003) assessed the effect of seismic operations on the foraging behaviour of moulting male long-tailed ducks in the Beaufort Sea. Long-tailed ducks are incapable of flying during the moult and, to compensate for this nutritionally costly moult process, increase their foraging time during this period. The findings of Lacroix *et al*. (2003) indicated that the abundance and distribution of ducks in both seismic and control areas changed similarly following the start of seismic operations suggesting that other influencing factors (e.g. wind) were more important for duck distribution than seismic activities, and that seismic activity did not significantly change the diving intensity of ducks. Overall, Lacroix *et al*. (2003) concluded that there was no evidence to suggest any displacement away from active seismic operations.

Although the Lacroix *et al.* (2003), Pichegru *et al*. (2017) and Sørensen *et al*. (2020) studies were not carried out on species potentially present within the OA, and found differing results, their results suggest that at most seabirds will be temporarily displaced from areas of active seismic operations, and displacement effects will be short-lived, with animals able to return to traditional feeding grounds after the Seismic Vessel has moved away. Behavioural disturbance to little penguins on the outer continental shelf is also possible at times when acquisition is undertaken on the upper slope or within the 2D tie line AA. However, relatively few little penguins are expected to be encountered foraging offshore on the outer shelf.

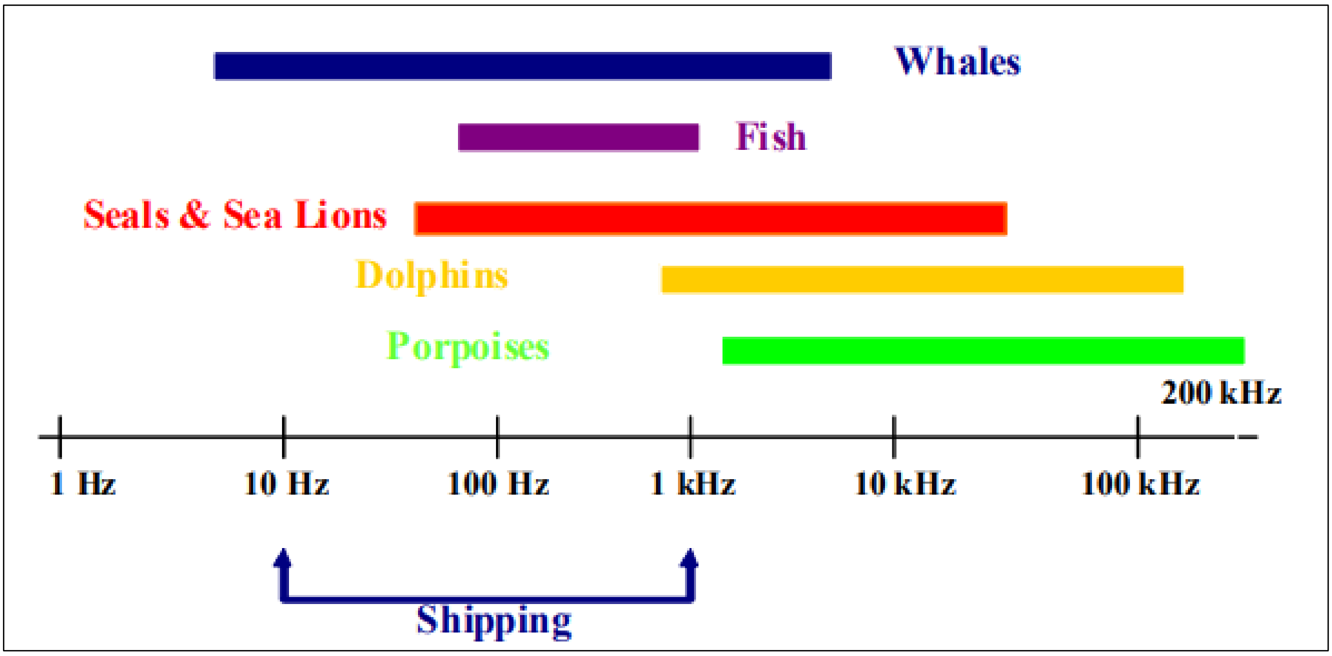
Consequently, the residual risk of behavioural impacts to seabird species from seismic sound exposure during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.2.2.4 Potential Perceptual Impacts

Sound produced by marine animals serve server functions including navigation, communication, and predator and prey detection. Even those animals that do not produce sound utilise the surrounding soundscape to learn about, and gain and overall awareness of, the environment (Fay and Popper, 2000). Hearing in animals allows the extraction of information from surroundings in more detail and at larger distances than with any of the other senses (Popper and Hawkins, 2019; Rogers *et al*., 2021). The addition of anthropogenic noise into the marine environment can disrupt an animal's ability to communicate and/or detect biologically important signals (Dunlop *et al.,* 2010). 'Masking' is an increase in the threshold for detection of discrimination of one sound as a consequence of another (Brumm and Slabbekoorn, 2005) and occurs when sounds overlap in time, frequency, and direction with biologically relevant sounds (Dooling and Leek, 2018). Masking can be either complete, whereby the signal is not detected at all, or partial, whereby the signal is detected but unable to be properly understood (Clark *et al*., 2009). This can lead to effects on an animal's fitness and survival, through blocking/alteration of signals alerting to the presence of predators (Lowry *et al*., 2012), incorrect assessment of the quality of rivals or potential mates lowering reproductive success (Halfwerk *et al.,* 2011), and disruption in group cohesion through a breakdown in communication particularly between parents and offspring (Leonard and Horn, 2012).

The general low frequency band of shipping noise overlaps with the frequencies generated by marine fauna, particularly fish, whales, and pinnipeds (**Figure 82**) (Southall and Hatch, 2008). Masking of biologically significant sounds has been suggested to be the primary effect of vessel noise on marine fauna (Southall, 2005).

Section 7.2.2.4.1 and **Section 7.2.2.4.2** provide a discussion on the effects of masking on auditory communication of fish and marine mammals (particularly cetaceans).



Source: Southall and Hatch, 2008.

Figure 82 Typical Frequency Bands of Sound Produced by Marine Fauna compared to Sounds associated with Commercial Shipping

7.2.2.4.1 Fish

Several species of fish communicate with sound, with vocalisations typically within a frequency band of 100 Hz to 1 kHz (Ladich *et al*., 2006; Bass and Ladich, 2008). Fish typically listen for relatively low-frequency, broadband, crackling, clicking, or buzzing sounds with relevant variety in the temporal patterns and spectral composition (Amorim *et al.,* 2015). Although there have been no studies on the effects of MSSs on masking effects in fish (studies have focused on physiological and behavioural effects, see **Section 7.2.2.2.3** and **Section 7.2.2.3.2**, respectively), all fish species that have been the target of sound studies to date have been able to hear (Popper and Hawkins, 2019), and other anthropogenic sounds such as vessel noise have been reported to cause masking (e.g. Picciulin *et al*., 2012; Putland *et al*., 2017).

Popper *et al*. (2014) indicate that for fish species with good hearing there is a greater likelihood of masking further from the acoustic source than close to it as masking is more likely for these fish when the animals are far enough away from the source for the sounds to merge and become more or less continuous rather than distinct events. Radford *et al*. (2014) suggest five ways in which fish might temporarily adapt to overcome or reduce the effect of masking communications:

- Spatial or temporal avoidance: Temporal avoidance involves taking advantage of gaps or fluctuations in competing noise. For example, silver perch vocalise less frequently when recordings of a predator (bottlenose dolphin) were played (Luczkovich *et al*., 2000);
- Temporal adjustments: Signal detection enhances as signal duration increases as a consequence of an increase in the probability that some of the signal is detected during a quieter period. For example, male toadfish increase their call rate to compete acoustically in the presence of rival males (Fine and Thorsen, 2008);
- Frequency shifts: Broadband sounds are more difficult to detect in a noisy environment than pure tones. For example, freshwater gobies in waterfall habitats produce vocalisations in a frequency that differs from that of the waterfall noise; they utilise available ‘windows’ in the background frequency range (Lugli *et al*., 2003); and
- Change in signalling modality**:** The repertoire of a species usually consists of more than one signal component; hence when one signal type is ineffective, the caller may swap to another signal type to increase the chance of detection, e.g. a change from vocalisations to visual signals.

Rogers *et al.* (2021) reported on the potential for masking to occur in fish populations as a result of an experimental seismic survey in Bergen, Norway. The authors concluded that the acoustic emissions from the seismic survey were sufficiently above ambient noise up to 10 km from the acoustic source and as a result, the acoustic emissions may contribute to masking biologically relevant sound to fish up to that distance from the acoustic source (Rogers *et al*., 2021). These results support those of Pine *et al*. (2020), whereby the authors concluded that masking effects for Atlantic cod in between discharges of an acoustic source would continue as long as the masking noise and fish were within at least 11 km of each other. Maximum masking effects in terms of listening and communication range were within 1.6 km and 2 km respectively, resulting in complete masking on a stationary fish for at least 12 – 15 minutes based on the seismic vessel travelling at a speed of 5 knots (Pine *et al*., 2020). However, Pine *et al*. (2020) note that anti-masking strategies were not assessed in the study which may result in an overestimation of true masking effects.

Based on the above findings, the Otway Basin 3D MC MSS will likely have a masking effect on fish communication, however, masking will not have detectable adverse effects to populations and recovery from any impacts is expected to occur. As such, the residual risk of negative impacts to masking of fish communication based on exposure to seismic emissions associated with the MSS has been assessed as **Low** (*Minor x Possible*).

7.2.2.4.2 Marine Mammals

Marine mammals are reliant on sounds for foraging, navigation, communication, reproduction, parental care, avoidance of predators, and to gain overall awareness of the environment (Thomas *et al*., 1992; Johnson *et al*., 2009). Hence, the ability to perceive biologically important sounds is fundamental to the survival of these animals. Acoustic masking occurs when an anthropogenic noise reduces the ability of an animal to perceive a signal (Wood *et al*. 2012; Erbe *et al.* 2016a). Masking is a common effect of underwater anthropogenic noise on marine mammals (Erbe *et al*., 2016) and activities that generate anthropogenic noise are increasing both spatially and temporally in coastal and oceanic environments worldwide (Hatch *et al*., 2016). For masking to occur the anthropogenic noise must be loud enough, be of similar frequency, and happen at the same time (Wood *et al.* 2012). In addition, the level of any masking effect depends on the location of the sender and receiver, source level and spectral characteristics of the signal, and the receiver's auditory capabilities (Erbe *et al*., 2016).

Marine mammals are broadly separated into categories based on hearing capability (Southall *et al*., 2019). The following categories are of relevance to the species potentially present during the Seismic Survey:

- Low frequency cetaceans (auditory bandwidth between c. 0.007 kHz and 22 kHz). Include all mysticete whales, i.e. all baleen whales. Species from this group that could occur in the OA include BW, minke whale, fin whale, sei whale, SRW, humpback whale, Bryde's whale and pygmy right whale;
- High-frequency cetaceans (auditory bandwidth between c. 0.15 kHz and 160 kHz). Include most dolphins, beaked whales, sperm whales and killer whales. Species from this group that could occur in the OA include sperm whales, Shepherd's beaked whale, True's beaked whale, Arnoux's beaked whale, Andrew's beaked whale, southern bottlenose whale, Gray's beaked whale, Blainville's beaked whale, Hector's beaked whale, strap-toothed beaked whale, Cuvier's beaked whale, gingko-toothed beaked whale, killer whale, false killer whale, pilot whales, Risso's dolphin, bottlenose dolphins, southern right whale dolphin, dusky dolphin, and common dolphin; and
- Very-high frequency cetaceans (auditory bandwidth between 0.2 kHz and 180 kHz). Include true porpoises, most river dolphins, pygmy/dwarf sperm whales, and Commerson's, Chilean, Heaviside's, Hector's hourglass and Peale's dolphins. Pygmy sperm whales, dwarf sperm whales and spectacled porpoise are the only species from this group that could occur in the OA.

Aguilar Soto *et al*. (2006) reported that elevated received noise levels from a passing large ship (with a closest point of approach of 700 m) coincided with an unusual foraging dive in Cuvier's beaked whales, suggesting that elevated noise from shipping may interrupt foraging behaviours by masking echolocation and communication. Evidence suggests that blue whales (McDonald, 2006), killer whales (Holt *et al,* 2008), and North Atlantic right whales (Parks *et al*., 2007) can adjust the frequency and loudness of their calls to compensative for masking by vessel noise, while fin whales alter bandwidth and duration of calls in response to increasing background noise from shipping (Castellote *et al.,* 2012). Communication in two delphinid species (bottlenose dolphin and pilot whales) was also demonstrated to be reduced in the presence of vessel traffic, with communication range reduced by 26% within 50 m of a vessel travelling at 5 knots (Jensen *et al.,* 2009). Interestingly, while humpback whales increase the source levels of their songs in response to wind noise (Dunlop *et al*., 2014), it has recently been reported that in the presence of both wind and vessel noise (both of which overlap in frequency with humpback songs) the amplitude of their singing only adjusted to compensate for wind and did not increase additively to compensate for vessel noise as well (Girola *et al*., 2023).

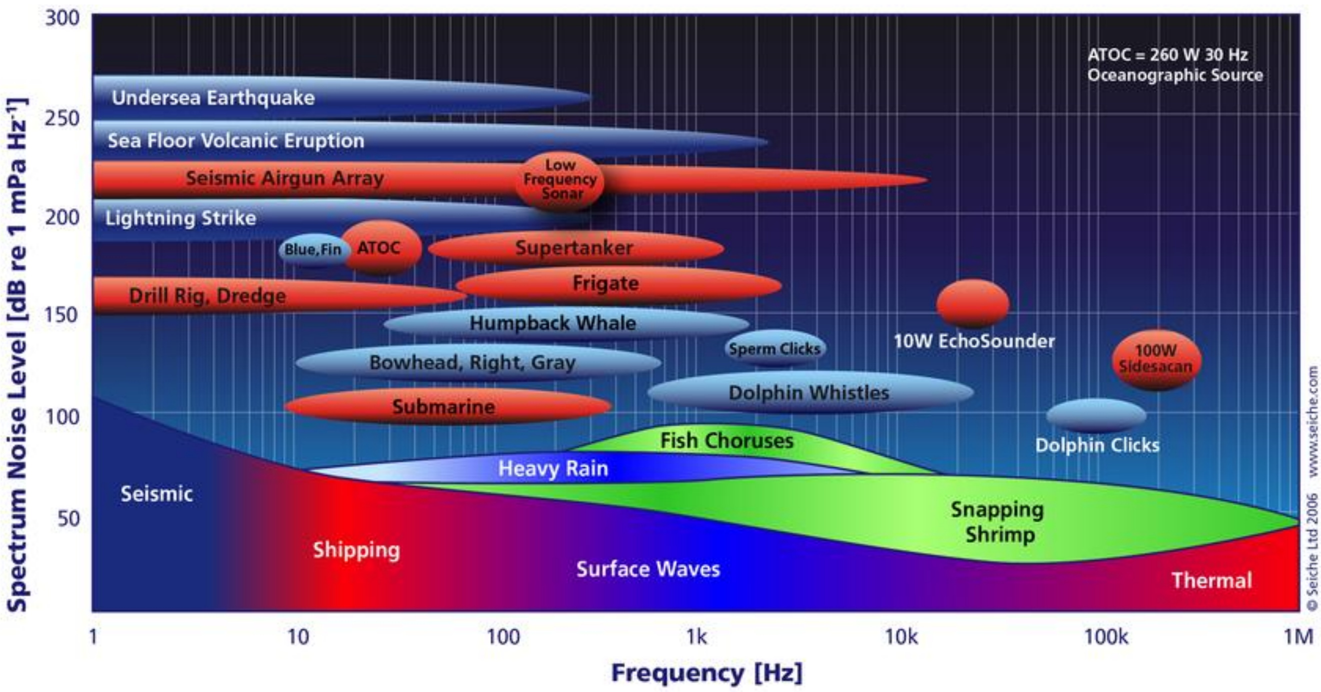
The sound generated by seismic surveys comprises brief, low frequency pulses (in the order of tens of milliseconds), occurring several seconds apart. At great distances from the seismic source, sound levels will be quieter, but transmission of the sound via multiple pathways (water, seabed) and reverberation mean that the pulse duration increases with distance. However, given the short seismic pulse duration relative to the duration of marine mammal vocalisations (several seconds to several minutes or longer), marine mammals are likely to be able to detect calls in between seismic pulses (Wood *et al.*, 2012).

The sound frequencies that are emitted by seismic acoustic sources are broadband, but with most of the energy concentrated between 0.1 kHz and 0.25 kHz. The greatest potential for interference with cetacean vocalisations is at the highest end of the seismic spectrum and the lowest end of the cetacean vocalisation spectrum (**Table** 80); i.e. the lowest frequency cetaceans are particularly affected since they have the most overlap with the frequencies of the seismic survey acoustic sources (**Figure 83**). Auditory masking of HF and VHF cetacean vocalisations is less likely as these species generally operate at higher frequencies than those generated by a seismic survey.

Table 80 Cetacean Communication and Echolocation Frequencies

Species	Communication Frequency (kHz)	Echolocation Frequency (kHz)
Southern right whale	0.03 – 2.2	N/A
Minke whale	0.06 – 6	N/A
Sei whale	1.5 – 3.5	N/A
Blue whale	0.0124 – 0.4	N/A
Fin whale	0.01 – 28	N/A
Humpback whale	0.025 – 10	N/A
Sperm whale	<9	0.1 – 30
Pygmy sperm whale	No data available	60 – 200
Beaked whales*	3 – 16	2 – 26
Common dolphin	0.5 – 18	0.2 – 150
Pilot whale	1 – 18	1 – 18
Killer whale	0.1 – 35	12 – 25
Bottlenose dolphin	0.2 – 24	0.5 – 130
* = using the bottlenose whale as an example		

Source: summarised from Simmonds *et al.*, 2004



Source: Professor Rodney Coates, The Advanced *SONAR* Course, Seiche (2002)*; from* www.seiche.com

Figure 83 Ambient and Localised Noise Sources in the Ocean

Several studies have documented compensation responses (anti-masking strategies) to anthropogenic underwater noise, including changes in vocalisation strength, frequency, and timing. (Erbe *et al*., 2016). For example, blue whales increased their calls (emitted during social encounters and feeding) when a seismic survey was operational in the area (Di lorio and Clark, 2010). Such adaptations have also been reported for humpback whales (McCauley *et al*., 1998; 2003b), beluga whales (Lesage *et al*., 1999), right whales (Parks *et al*., 2007, 2011), killer whales (Holt *et al.*, 2008), and bottlenose dolphins (van Ginkel *et al*., 2017). It is thought that increased calling enhances the probability that communication signals will be successfully received by conspecifics by reducing the effects of auditory masking.

Marine mammals may also cease vocalising in response to anthropogenic noise, as has been demonstrated in humpback whales at breeding grounds off Angola during a seismic survey. In this study, singing activity declined as received levels of seismic noise increased (Cerchio *et al*., 2014). This response is not novel to seismic surveys, with humpbacks also halting vocalisations in response to emissions from acoustic fisheries tools (Risch *et al.,* 2012). Cessation in clicking was also observed in sperm whales by Bowles *et al.* (1994) in response to weak seismic survey noise (received level of 115 dB re 1 µPa); however, contradictory to the findings of Bowles *et al.* (1994), Madsen *et al*. (2002) did not document any changes in male sperm whale clicks in response to an MSS off Norway. Sperm whales did not cease clicking and did not seem to alter their normal acoustic behaviour during feeding (Madsen *et al*., 2002). Decreases of three echolocation parameters (number of clicks per minute, minutes with detectable click trains and feeding buzz frequency) were also reported for harbour porpoises in the Danish North Sea within an 8 – 12 km radius of seismic acquisition (Sarnocinska *et al*., 2020). The authors of this study provided evidence to suggest that displacement of porpoises was not the main driver of this effect, but instead that the results instead suggest a change in echolocation behaviour representing a decrease in porpoise foraging efficacy.

Bowhead whales in the vicinity of an active seismic source varied their calling rate as received SELs changed (Blackwell *et al*., 2015). At very low SELs (only just detectable) calling rates increased. As SELs continued to increase, calling rates levelled off (as SELs reached 94 dB re 1 µPa^2-s), then began decreasing (at SELs greater than 127 dB re 1 µPa^2-s), with whales falling virtually silent once SELs exceeded 160 dB re 1 µPa^2-s. Hence adaptations to masking for some species may be limited to circumstances when whales are subject to only low to moderate SELs. Similar results were also reported by Thode *et al*. (2020) where bowhead whale call density increased with exposure to weak SELs from MSS (a 10 – 15 dB increased above ambient noise) and then dropped with increasing cumulative SELs. This study confirmed that whales could completely compensate for MSS noise at low received levels (with whale call volume increasing by nearly 20 dB), but this ability increasingly diminished as MSS noise levels rose; to the point where a 40 dB increase in cumulative SEL (from MSS) prompted call level increases of only a few dB whereby whale communication space was substantially compromised.

Blue whales vocalise at a low frequency (average of 0.01 – 0.110 kHz) (McDonald *et al*., 2001; Miller *et al*., 2014), meaning that their calls can travel hundreds of kilometres underwater. The amplitude of their calls can reach levels of up to 188 dB re 1ɥPa m-1 (Aroyan *et al*., 2000; Cummings and Thompson, 1971). PAM has proven to be ineffective at detecting the low frequencies of blue whale calls and some other baleen whales. While TGS will utilise a PAM system during the Otway Basin 3D MC MSS (**Appendix LJ**) this system will primarily be useful for detecting HF and VHF cetaceans, (particularly sperm whales). Mitigations for baleen whales have been designed without reliance on PAM detections as PAM is not particularly effective at detecting LF cetaceans.

It is likely that marine mammals in the vicinity of the OA during the Otway Basin 3D MC MSS may be subject to some masking effects. In particular, the frequency of baleen whale calls overlaps directly with the low frequency seismic operations (**Figure 83**). The long survey lines of the Otway Basin 3D MC MSS will reduce the potential for significant masking effects as underwater noise from the active source will be transitory throughout the OA (i.e. not focused in any one area for an extended period). A comprehensive suite of control measures will be implemented during the Otway Basin 3D MC MSS to minimise potential impacts to cetaceans that may arise from the effects of acoustic disturbance (**Table 84**).

Masking levels are difficult to predict, and no auditory thresholds exist for predicting masking effects on marine mammals (Erbe *et al*., 2016); however, as outlined above masking responses (e.g. changes in calling rates) have been documented to occur at relatively low exposure levels (i.e. lower than would elicit any behavioural response). The UAM results for the Otway Basin 3D MC MSS clearly predict relatively high cumulative SELs (**Table 70**); hence sound levels sufficient to elicit masking will certainly occur in the OA and surrounding waters. Any masking effects will however cease at the completion of the survey and are highly unlikely to have detectable population level effects on any marine mammal species. On this basis the residual risk of impacts to noise perception by marine mammal species from seismic sound exposure and vessel noise during the Otway Basin 3D MC MSS has been assessed as **Moderate** (*Minor* x *Certain*).

7.2.2.5 Potential Impacts and Risks on Protected and Sensitive Areas in the Marine Coastal Environment

Several protected and sensitive environments, species and habitats have been identified in the waters within the OA (**Section 4.4**). These include AMPs, KEFs, BIAs, and the Australian Whale Sanctuary.

The following sections provides an assessment on potential effects on the values within these protected and sensitive environments from noise emissions associated with the proposed Otway Basin 3D MC MSS. It is worth noting that the following sections have only focused on those sensitive areas that may be impacted by the acoustic disturbance associated with the Otway Basin 3D MC MSS OA.

7.2.2.5.1 Australian Marine Parks

The OA directly overlaps with two AMPs; the Nelson AMP and the Zeehan AMP. A further two AMPs are located within the wider EMBA, in relatively close proximity to the OA. These are the Apollo AMP and Franklin AMP, which lie 46 km and 42 km from the OA, however, this distance is considered sufficient to protect the Apollo AMP and Franklin AMP from the effects of acoustic emissions.

The conservation and management of these AMPs falls under the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 which sets out the management zoning and IUCN categorisation within each AMP and determines the activities allowed within each zone in accordance with the EPBC Act.

The categorisation and zoning consider the purposes for which the reserves were declared, the objectives of the Management Plan, and the requirements of the EPBC Act and associated regulations. The IUCN Category Zones for each of the AMPs is outlined within **Table 14** and a discussion on the key management principles and purpose of each AMP is also outlined within **Table 14**.

NOPSEMA Guidance Note "*Petroleum activities and Australian Marine* Parks' (N-04750-GN1785 A620236) states that "*Petroleum activities may be allowable in Multiple Use Zones and Special Purpose Zones (IUCN category IV) subject to environmental approvals and demonstration that environmental impacts will be consistent with the relevant management plan"* and that "*Titleholders undertaking petroleum activities in Australian waters must ensure that any potential environmental impacts from the petroleum activities are managed to be consistent with the relevant management plan".* The Zeehan AMP and Nelson AMP cover IUCN Category VI (Special Purpose Zone and Multiple Use Zone), as seen in **Figure 13**. The South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 allows for MSSs within these areas in accordance with a class approval issued by the Director of National Parks. Class approvals are issued subject to conditions that are considered necessary, including to ensure the activity is conducted in a manner to avoid or minimise impacts. When an EP is being prepared for an offshore activity and there is potential to affect a marine park, the DNP must be consulted as a relevant authority under Regulation 11A of the Environment Regulations so that any objections or claims about environmental impacts of the activity on the marine park values can be made prior to the submission of the EP. The following criteria trigger the need for consultation with the DNP:

- Any proposed activity to occur **within** an AMP;
- Any proposed activity to occur **adjacent to** and AMP; and
- Any proposed activity that could affect an AMP's established values irrespective of where the activity takes place in relation to the park.

TGS has consulted with the DNP (see **Section 5** and **Appendix K**) throughout the development of this EP, with consultation continuing for the life of the EP. The DNP noted that the OA of the Otway Basin 3D MC MSS overlaps with the Nelson and Zeehan AMPs and if survey activities are not managed correctly, they could affect the parks' natural, social, and economic values. The DNP made the following objections and claims regarding noise emissions on sensitivities within the AMPs:

- Activities that may prevent of displace PBW or SRW use of BIAs are avoided;
- Activities are timed to avoid species' peak migration and foraging behaviours;
- Potential cumulative impacts upon species are addressed, including, but not limited to cetaceans (PTs and TTS) as well as impacts to availability of food (krill). Impacts to giant crab and southern rock lobster should be explored noting that some populations could be exposed to repeated surveys;

- Identify a comprehensive suite of whale detection measures including regular aerial surveillance flights to identify presence/absence/species and direction of movement and Pam to support the efficacy and reliability of shut-down protocols for marine mammals;
- Seismic array to operate at low power during line turns to minimise the risk of SRW and blue whale/PBW entering the zone of potential TTS or behavioural disturbance during shut-downs;
- Spatial avoidance of fishing grounds and, or, temporal avoidance of fishing seasons;
- Excising giant crab and southern rock lobster habitat within the canyon area in the southwest of the survey from the AA, consistent with that applied to the ConocoPhillips Sequoia survey;
- Reducing the overall area to be surveyed or splitting the area into smaller areas to be acquired to avoid peak utilization rates and reduce cumulative impacts upon the environment; and
- Set a limit to the number of days far acquisition at full power and, or the total distance of sail lines for acquisition at full power.

Furthermore, the DNP advised that in the context of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 objectives and values, TGS should ensure that the EP:

- Identifies and manages all impacts and risks on AMP values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable; and
- Clearly demonstrates that the activity will not be inconsistent with the management plan.

The DNP noted that the AA is adjacent to, and overlaps with, the following biologically important areas:

- Foraging areas for numerous protected seabirds;
- Core use and range area for the SRW;
- PBW seasonal feeding aggregations are supported by upwelling systems located at the Bonney Upwelling system and adjacent waters off South Australian and VIC; and
- Presence of southern rock lobster and giant crab within the proposed AA, including previously excised areas in the recent ConocoPhillips acquisition.

To avoid unnecessary duplication in this EP, the values associated with the Nelson AMP and Zeehan AMP, and those identified by the DNP, and where the potential impacts on those values are addressed within this EP are outlined in **Table 81.**

An EP cannot be approved if the activity is likely to result in unacceptable impacts that are inconsistent with the IUCN principles and relevant Management Plan objectives. Based on the discussions within **7.2.2** along with the implementation of the control measures, it is considered that the Otway Basin 3D MC MSS will not be inconsistent with the IUCN principles and the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 objectives when operating within the OA.

Based on the risk assessments for all marine receptors, the total residual risk to AMPs within the OA from noise emissions arising from the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Unlikely*).

Table 81 Conservation Values within the Nelson AMP and Zeehan AMP that may be affected by Acoustic Disturbance

Conservation Values	Location in EP for full assessment of acoustic effects on conservation values
Ecosystems, habitats, and communities associated with the Tasmania Province, West Tasmania Transition, Western Bass Strait Shelf Transition, and associated sea-floor features (abyssal plain/deep ocean floor, canyon, deep/hole/valley, knoll/abyssal hill, shelf, slope).	The Zeehan AMP covers some of the West Tasmanian Canyons KEF. This KEF is considered important as it supports a high biodiversity of benthic invertebrates and facilitates high productivity. Physiological and behavioural impacts of acoustic disturbances on benthic invertebrates are addressed in **Section 7.2.2.2.2** and **Section 7.2.2.3.1** respectively, with the potential risk of these impacts on benthic invertebrates assessed as at worst, low. Acoustic disturbance impacts on plankton/productivity have been assessed within **Section 7.2.2.2.1**, and have been determined to have at worst a low risk. Any impacts on sessile benthic invertebrates are expected to be temporary, localised and restricted to the parent population. Changes at the community level will unlikely be discernible from the natural variation observed. As with sessile benthic invertebrates, any potential impacts on productivity are also expected to be temporary and localised, with populations rapidly refreshed from the surrounding environment. Due to the temporary and localised nature of the effects, biodiversity will be protected and maintained in the long-term and the functioning and integrity of these benthic communities will be maintained. The Otway Basin 3D MC MSS will not be inconsistent with the principles and the objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023.
Cetaceans: • Blue, humpback, fin and sei whale migrations; and • Seasonal feeding aggregations of PBW.	Potential impacts on whales (including migrations) have been assessed in **Section 7.2.2.2.7** (physiological impacts), **Section 7.2.2.3.6** (behavioural impacts), and **Section 7.2.2.4.2** (perceptual impacts), which in turn directly relate to potential impacts on the PBW and SRW BIAs. The results of these sections found that, based on the control measures that will be implemented for the Otway Basin 3D MC MSS, the impacts are at worst moderate. Due to this and the control measures in place to manage any potential impacts on whale migrations, it is considered that the Otway Basin 3D MC MSS will not be inconsistent with the principles and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 regarding migrating and foraging cetaceans.

Conservation Values	Location in EP for full assessment of acoustic effects on conservation values
Seabird foraging – black-browed, wandering, and shy albatrosses, and great-winged and cape petrels.	Potential impacts on seabirds have been assessed in **Section 7.2.2.2.8** (physiological impacts) and **Section 7.2.2.3.7** (behavioural impacts). The results of these sections found that the impacts of acoustic disturbance directly on seabirds are at worst low. However, impacts of acoustic disturbance on seabird prey at foraging areas must also be taken into consideration. Potential physiological impacts on zooplankton and fish, and behavioural impacts on fish have been assessed in **Section 7.2.2.2.1, Section 7.2.2.2.3**, and **Section 7.2.2.3.2** respectively. The results of these sections found that the impacts to seabird prey (zooplankton and fish) will be at worst low. Due to this, it is considered that the Otway Basin 3D MC MSS will not be inconsistent with the principles and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 regarding foraging seabirds.
Southern rock lobster and giant crab.	Potential impacts on southern rock lobster and giant crab have been assessed in **Section 7.2.2.2.1** (physiological) and **Section 7.2.2.3.1** (behavioural). The results of these sections found that the impacts of acoustic disturbance on southern rock lobster and giant crab are at worst low. Furthermore, as discussed in **Section 7.1.3.1**, TGS will implement **a** Giant Crab Acoustic Exclusion Area (**Figure 74**) over waters that are 1,000 m or less along the eastern boundary of the AA. There will be no activation of the acoustic source within this exclusion area, providing protection to rock lobster and giant crab habitat from the highest acoustic emissions. Due to this, it is considered that the Otway Basin 3D MC MSS will not be inconsistent with the principles and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023 regarding foraging seabirds.

7.2.2.5.2 Biologically Important Areas

As discussed in **Section 4.4.4**, BIAs are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviours. While these areas have no legal status, several Conservation Management Plans outline recommendations for MSSs operating within a defined BIA. BIAs for marine mammals, seabirds and elasmobranchs have been registered within the OA; these include PBW (distribution and foraging), SRW (known core range), wedge-tailed shearwater (foraging), short-tailed shearwater (foraging), wandering albatross (foraging), Antipodean albatross (foraging), Australasian gannet (foraging), white-faced storm-petrel (foraging), common diving petrel (foraging), Buller's albatross (foraging), shy albatross (foraging), Indian yellow-nosed albatross (foraging), black-browed albatross (foraging), Campbell albatross (foraging), and white shark (distribution)(see summary in **Table 16**).

There are twelve species of threatened and/or migratory seabird species (classified by the EPBC Act) with BIAs that overlap with the OA. The potential impacts of acoustic disturbances on seabirds have been discussed in **Section 7.2.2.2.8** (physiological impacts) and **Section 7.2.2.3.7** (behavioural impacts). The residual risks from acoustic emissions during the Otway Basin 3D MC MSS on seabirds for potential physiological and behavioural effects have been assessed as Low. In addition to direct effects on seabirds, indirect effects on seabirds due to effects on prey (fish and plankton) have been assessed within this EP in **Section 7.2.2.2.1** (physiological effects on plankton), **Section 7.2.2.3.2** (physiological effects on fish), and **Section 7.2.2.3.2** (behavioural effects on fish).

As depicted in **Figure 21**, the OA overlaps with several BIAs for the white shark; distribution (two BIAs), low density distribution, and known distribution. However, as described within **Table 23**, these BIAs largely cover water depths outside of the OA, reducing the overlap of the OA with biologically important habitats for white sharks. The potential impacts of acoustic disturbances on white sharks have been discussed in **Section 7.2.2.2.4** (physiological impacts), **Section 7.2.2.3.3** (behavioural impacts), and **Section 7.2.2.4.1** (perceptual impacts). As a result, the residual risk of impacts to elasmobranchs (including white sharks) from seismic sound exposure during the Otway Basin 3D MC MSS has been assessed as **Low** for potential physiological impacts and as **Low** for potential behavioural impacts.

The known core range BIA for SRWs overlaps with the OA along the northern and eastern boundary. The total area overlap of the SRW known core range BIA with the Oa is 1,356 km^2. There is a moderate likelihood of encountering SRWs in and around the BIA, and therefore the inshore portion of the OA during the breeding season (September to October) and shoulder season (i.e April and October). The potential impacts of acoustic disturbances on SRW have been discussed in detail in **Section 7.2.2.2.7** (physiological impacts), **Section 7.2.2.3.6** (behavioural impacts), and **Section 7.2.2.4.2** (perceptual impacts).

PBW distribution, foraging, foraging (annual high use area) and known foraging area BIAs overlap with the OA along the northern and eastern boundary. The total area overlap of the PBW BIAs with the OA is 7.779 km^2. There is a high likelihood of encountering PBW in and around the BIAs during the core foraging season (January to June inclusive) and the foraging shoulder season (November/December and July). The potential impacts of acoustic disturbances on blue whales/PBW have been discussed in detail in **Section 7.2.2.2.7** (physiological impacts), **Section 7.2.2.3.6** (behavioural impacts), and **Section 7.2.2.4.2** (perceptual impacts).

All marine mammals in Australian waters are fully protected under the EPBC Act, therefore the potential for causing adverse effects during any MSS is taken extremely seriously. Animat modelling results from the UAM undertaken for the Otway Basin 3D MC MSS indicate that the standard Shut-down Zones recommended in Policy Statement 2.1 are insufficient to manage the risk of auditory impairment to baleen whales during the Otway Basin 3D MC MSS. Based on the results of the UAM, additional management procedures and control measures have been proposed and will be implemented for SRWs and PBWs during the Otway Basin 3D MC MSS when the acoustic source is active in the BIAs and buffer areas (see proposed control measures in **Section 7.2.2.2.7**, **Section 7.2.2.3.6**, and **Section 7.2.2.4.2** and a summary of all control measures for managing acoustic disturbance during the Otway Basin 3D MC MSS in **Table 84**).

With specific regards to the objectives of the SRW Conservation Management Plan, the Otway Basin 3D MC MSS will be consistent with the objectives of this plan, and it is considered that anthropogenic noise in the SRW known core range BIA will be managed through the survey design and implementation of the additional control measures so that SRWs may continue to utilise the area without injuries or behavioural disturbances. It is therefore considered that the residual environmental impacts and risks of the proposed Otway Basin 3D MC MSS on SRWs are managed to an **Acceptable Level**.

With specific regards to the objectives of the blue whale/PBW recovery plan, the Otway Basin 3D MC MSS will be consistent with the objectives within this recovery plan, and it is considered that anthropogenic noise in the PBW migratory BIA will be managed through the survey design and implementation of the additional control measures so that any blue whale/PBW may continue to utilize the area without injuries or behavioural disturbances. Therefore, it is considered that the residual environmental impacts and risks of the proposed Otway Basin 3D MC MSS on blue whales/PBWs are managed to an **Acceptable Level**.

The residual risk of potential physiological impacts on blue whales/PBWs and SRWs arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Low** (*Moderate* x *Rare*). The residual risk of behavioural impacts to blue whales/PBWs and SRWs from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Moderate** (*Moderate x Likely*). The residual risk of impacts to noise perception on blue whales/PBWs and SRWs from seismic sound exposure and vessel noise during the Otway Basin 3D MC MSS has been assessed as **Moderate** *(Minor x Certain).*

Based on the risk assessments for all marine receptors, the total residual risk to all BIAs within the OA from noise emissions arising from the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Unlikely*).

7.2.2.5.3 Key Ecological Features

The OA overlaps with one KEF; the West Tasmania Canyons. The Bonney Coast Upwelling KEF lies outside of the boundaries of the OA but relatively close in proximity at 12.8 km north (see **Section 4.4.3** and **Figure 14**).

The West Tasmania Canyons KEF is recognised for its high biodiversity of benthic invertebrates and high productivity. The Bonney Coast Upwelling KEF covers the area that is annually influenced by the Bonney Upwelling which supports foraging grounds of several marine species listed within the EPBC Act (many of these species have BIAs that incorporate the Bonney Coast Upwelling KEF).

The known and potential impacts from acoustic disturbances associated with the Otway Basin 3D MC MSS on all identified marine receptors supported by the West Tasmanian Canyons and Bonney Coast Upwelling KEFs, have been discussed throughout **Sections 7.2.2.2** (potential physiological effects) and **Section 7.2.2.3** (potential behavioural effects), as well as **Section 7.2.2.4** (potential perceptual effects) together with a residual risk assessment for each receptor.

The residual risk of potential impacts on marine receptors, apart from marine mammals, arising from acoustic disturbance during the Otway Basin 3D MC MSS has been assessed as **Low.** The residual risk of potential impacts on marine mammals arising from acoustic disturbance during the Otway Basin 3D MS MSS has been assessed as **Low** – **Moderate**; however, there will be several additional control measures in place that TGS will implement when operating within the PBW and SRW BIAs and during sensitive periods for these species.

Based on the risk assessments for all marine receptors, the residual risk to the West Tasmania Canyons and Bonney Coast Upwelling KEFs arising from the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Unlikely*).

7.2.3 Evaluation of Known and Potential Impacts to Other Marine Users

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 55**.

Table 82 Relevant Persons and Marine Users Assessed

Receptor	Section reference
Commercial Fisheries	**Section 7.2.3.1**
Commercial and Recreational Dive Operations	**Section 7.2.3.2**
UXOs and Defence Activities	**Section 7.2.3.3**
Cultural and Heritage Values	**Section 7.2.3.4**

7.2.3.1 Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries

Increased sound levels associated with seismic acquisition may impact on target fish and invertebrate species present or adjacent to the AA, including target fish species for commercial fisheries. Based on the catch and effort data analysed by TGS, acoustic emissions have the potential to interact mainly with the CTS, SHS, Gillnet Hook and Trap Sector, SSJF, ETBF, and the long-line sector of the SBTF (see **Section 4.7.3**)..

Acoustic disturbance associated with MSSs may modify fish behaviour, and this is often observed as fish moving away from a loud acoustic source to reduce or minimise their exposure. As a result of modified fish behaviour, local abundances, distributions and, consequently, catch rates may be impacted during MSSs. This has the potential to manifest as short-term effects on catch rates within and around a survey area. However, fish behavioural responses are often observed to be temporary and short-term, with fish returning to their original area after a short period of time. For example, studies by Engås *et al.* (1996) and Slotte *et al*. (2004) have observed fish species (cod/haddock and blue whiting/herring respectively) moving back to their original areas within five days following the completion of seismic activity.

There is potential for fish in proximity to the acoustic source to modify their behaviour in areas of increased sound levels resulting from seismic operations, which may include active avoidance, schooling behaviour modification, a change in feeding patterns, or changes in local abundance and distribution within and around the area being surveyed. As noted by Salgado Kent *et al*. (2016) "*The issue of changes in commercial fisheries catch rates due to seismic surveys is almost always contentious in Australia*". They acknowledge that there has been some effort to relate fisheries catch data to seismic survey effort, but none of the Australian efforts to relate finfish catch rates with seismic surveys yielded results of any meaning.

Short-term effects on commercial and recreational catches may occur within and around a survey area. Sound effects on fishing catches are somewhat equivocal because of the lack of determination between natural movements and changes in fish. International studies have reported no significant effects of seismic activities on catch rates from a variety of taxa including crustaceans, cephalopods, teleosts, (La Bella *et al*., 1996; Jakupsstovu *et al*., 2001). Some studies have indicated that catch rates have decreased or increased following seismic activities however these changes have been reported to be temporary (Streever *et al*., 2016), and it has been suggested that the results of some studies have been influenced by a range of confounded experimental factors (Skalski *et al*., 1992; Gausland, 2003; Richardson *et al*., 2017). Where catch rates have been detected to reduce following exposure to seismic emissions a number of studies have reported that post-survey catch levels return to pre-survey levels following the cessation of seismic activities (e.g. Carroll *et al.,* 2017). Given the evidence of fish returning to survey areas following the cessation of seismic/acoustic activities, it is considered that any effects on fish and fish populations will be temporary, and fish will return to normal behaviour and distributions within days of any acoustic exposure.

For example, following a 2015 seismic survey in the Bass Strait, Przeslawski *et al*. (2016) investigated the effects of the survey on scallops, fish, and commercial catch rates. Przeslawski *et al*. (2016) found catch rates over the six months following completion of the survey were different than predicted for nine out of the 15 species within the Danish Seine and Demersal Gillnet sectors. Six species (tiger flathead, goatfish, elephantfish, boarfish, broadnose shark and school shark) increased in catch, while three species (gummy shark, red gurnard, sawshark) decreased in catch. The results of Przeslawski *et al*. (2016) support other works in which the effects of seismic surveys on catch are limited (e.g. Thomson *et* al., 2014; Bruce *et al*., 2018) and seem transitory and vary among studies, species, and gear types.

A critical review of the potential impacts of marine seismic surveys on fish and invertebrates also found that other studies on fish have positive, inconsistent, or no effects from seismic surveys on catch rates or abundance (Carroll *et al*., 2017). The body of peer-reviewed literature does not indicate any long-term abandonment of fishing grounds by commercial species, with several studies indicating that catch levels were similar to pre-survey levels after seismic activity had ceased (Carroll *et al.,* 2017). As noted by Przeslawski *et al*. (2016), it is possible that fish may be displaced from a survey footprint to adjacent areas, however, the total number of fish within the fishery stock remains unchanged.

Recently, Meekan *et al.* (2021) undertook a large-scale experiment that quantified the impacts of exposure of an assemblage of tropical demersal emperors (Lutjanidae), snappers (Lethrinidae) and groupers/rock cods (Epinephelidae) to a commercial-scale seismic source on the North West Shelf of Western Australia. The authors used a combination of Baited Remote Underwater Video Systems and acoustic tagging methods to measure the behaviours and movements of fishes at high, medium, and low exposure sites, as well as at control sites. Meekan *et al*. (2021) found no short-term (days) or long-term (months) effects of exposure on the composition, abundance, size structure, behaviour, or movement of fishes. The authors argue that it is a reasonable assumption that the behavioural responses of demersal fishes to the bait cue provided by the Baited Remote Underwater Video Systems are a realistic proxy of the likely response of the same species to baited hooks or traps used by the commercial fisheries that target them. The acoustic tags and telemetry found little evidence that fish were displaced by the exposure to the seismic source. Movements of tagged fish occurred over a limited area focused on two or three acoustic receivers, and there was no evidence for the departure of tagged fish after exposure. These multiple lines of evidence suggest that seismic surveys have little impact on demersal fishes in this environment (Meekan *et al*., 2021).

Fishwell Consulting Pty Ltd (2020) provide preliminary results from a multiple BACI analysis of the effect of a full-scale commercial 3D MSS on Danish Seine catch rates of two continental shelf species in waters off Lakes Entrance, VIC, specifically flathead (*Platycephalus* spp.) and eastern school whiting (*Sillago flindersi*). The MSS was undertaken in four phases in 2020 and preliminary results are currently published for the first three phases.

Preliminary results for whiting are reported as:

- During Phase I, zero catches comprised 7% of records in Control sites and 95% of records in Impact sites. The impact effect on whiting was estimated to be a 99.7% reduction in catch rates relative to Control Sites (this was statistically significant);
- During Phase II, zero catches comprised 14% of records in Control sites and 23% of records in Impact sites. The impact effect on whiting was estimated to be a 42.7% reduction in catch rates relative to Control Sites (this was statistically significant);
- During Phase III, zero catches comprised 16% of records in Control sites and 33% of records in Impact sites. The impact effect on whiting was between 79.5% less and 60.1% more than those from Control Sites (this was not statistically significant); and
- Overall, the BACI analyses provide robust evidence for a negative impact of seismic acquisition on whiting catch rates in the Danish Seine Fishery up to ~100 days following the MSS.

Preliminary results for flathead are reported as:

- During Phase I, zero catches comprised 2% of records in Control Sites and 22% of records in Impact Sites. The impact effect on flathead was estimated to be a 78.1% reduction in catch rates relative to Control Sites;

- During Phase II, zero catches comprised 9% of records in Control Sites and 5% of records in Impact Sites. The impact effect on flathead was estimated to be a 58.0% reduction in catch rates relative to Control Sites;
- During Phase III, zero catches comprised 20% of records in Control Sites and 25% of records in Impact Sites. The impact effect on flathead was estimated to be a 65.5% reduction in catch rates relative to Control Sites; and
- Overall, the BACI analyses provide robust evidence for a negative impact of the seismic acquisition on flathead catch rates in the Danish Seine Fishery up to ~200 days following the MSS.

The reported long-term reduction in catch of both target species by Fishwell Consulting Pty Ltd (2020) is in contrast with most other studies where impacts to fish are typically more short term (minutes, hours, days). Although the apparently statistically significant differences between impact and control sites and the reason for the effects lasting 100/200 days are notable, the shallow water exposures in the Fishwell Consulting Pty Ltd (2020) study area are not representative of those that will occur during the Otway Basin 3D MC MSS given the significantly greater water depths.

Fishwell Consulting Pty Ltd (2020) also present historical logbook data for the period 2014 to 2019, as well as the 2020 MSS, which demonstrates that catch levels of both species were already highly variable and in decline prior to the MSS. The logbook data also shows that in 2020 during and after the seismic survey, catch levels at both impact and control sites for both species were some of the lowest on record since 2014 suggesting that there may be other broader factors involved during 2020 and the study is inconclusive on this point.

Catch rates could also conceivably change in response to flow-on effects associated with changes in the abundance or distribution of zooplankton prey. As discussed in **Section 7.2.2.2.1**, a recent study by McCauley *et al*. (2017) links MSSs to zooplankton mortality, which could presumably have a negative effect on the prey availability for some pelagic fish species. However, any potential flow-on effects to marine food webs are expected to be spatially restricted to within a few kilometres of the survey vessel with baseline conditions resuming relatively quickly after survey completion (see Richardson *et al*., 2017).

In the even that commercial fishers do experience a loss in catch due to the Otway Basin 3D MC MSS, they may submit claims to TGS for compensation. The Seismic Vessel will change sail lines to accommodate commercial fishers' requests if it is feasible to do so, providing there is open and advanced communication from the commercial fishing operator of their intention to fish at a specified location, no other environmental performance commitments in this EP conflict with a change in sail lines, and providing TGS is afforded a reasonable opportunity to complete the Otway Basin 3D MC MSS in a timely and efficient manner. TGS is committed to working with relevant commercial fishers to enable fair and reasonable concurrent operations. Control measures for mitigating the effects of acoustic emissions on commercial fishers are provided in **Table 87**.

Commonwealth Trawl Sector, Scalefish Hook Sector and Gillnet Hook and Trap Sector

Most of the demersal and pelagic fish species targeted by the CTS, SHS, and Gillnet Hook and Trap sectors belong to the Group I or II hearing categories (see **Section 7.2.2.2.3.1**). As such, they are not sensitive to sound pressure and are primarily sensitive to the particle motion components of seismic discharges at relatively close range. The potential for behavioural impacts in these categories of fishes is high in the near-field (tens of metres), moderate at intermediate distances (hundreds of metres) and low in the far field (thousands of metres). Behavioural effects are noted in the relevant research to last for minutes or hours, and rarely for days following exposure.

Haddon (2017) reported on the potential effects of an MSS on commercial catch rates in the GAB trawl sector (which targets similar demersal fish species as the CTS) following 3D MSSs on the edge of the continental shelf in 2015. The author notes that the MSS may have led to the results of fishery independent surveys conducted in the area at the same time being biased low. However, the fishery independent survey results also demonstrated that catch levels can quickly recover once the MSS is over. The MSS did not have a lasting impact on catch rates, which returned to typical values within the first month following the MSS (Haddon, 2017).

A study in the Bass Strait and Gippsland Basin region of Australia, examined fisheries catch-per-unit-effort data obtained from commercial logbooks for several benthic and demersal fish species, including school whiting, tiger flathead, eastern gemfish, silver warehou, jackass morwong, blue eye trevalla, school shark and gummy shark (Thomson *et al.,* 2014). Comparison of mean catch rates for fishing operations that occurred close to and shortly after the MSS, with catch rates for fishing operations that occurred further away in both space and time, resulted in a range of different results, both positive and negative. However, the majority of these differed by less than 10%, which is a relatively small difference when compared with normal inter-annual variation. The authors concluded that there were no clear or consistent relationships between MSSs, and subsequent fisheries catch rates; however, they highlight that the coarse detail of the catch-per-unit-effort data and the variety of results meant it wasn't possible to identify if localised and short to medium-term impacts (days or weeks) to catch rates had occurred (Thomson *et al*., 2014).

A subsequent study in the same region examined catch rates for two fishing gear types (danish seine and demersal gillnet) and fifteen demersal fish species (Przeslawki *et al*., 2016; Bruce *et al*., 2018). Catch rates in the six months following the MSS were different than predicted in nine out of the 15 fish species. For both fishing gear types, six species (tiger flathead, goatfish, elephant fish, boarfish, broadnose shark and school shark) indicated increases in catch following the MSS, and three species (gummy shark, red gurnard, saw shark) indicated decreases in catch. No meaningful difference could be determined for the other six species. Bruce *et al.* (2018) noted that, except for minor changes in the daily movement patterns of flathead, there was little evidence for consistent behavioural or catch rate changes induced by the seismic survey in the targeted species. Przeslawski *et al*. (2016) concluded that "*These results support previous work in which the effects of seismic surveys on catch seem transitory and vary among studies, species, and gear types*". Though the Thomson *et al*. (2014) and Przeslawski *et al.* (2016) relates to continental shelf demersal species and a different sub-sector of the CTS, the effect on these benthic species is considered broadly indicative of species targeted on the outer shelf and slope, noting that the deeper waters in the AA, will result in lower sound levels at the seabed.

International studies that report no significant effects of MSS on catch rates include Pickett *et al*. (1994), who documented the distribution of bass in Lyme Bay (UK) during a seismic survey (peak source of 202 dB re 1 µPa@1 m) over three and a half months and found no long-term changes in bass distribution or large-scale emigrations from the survey area. In another study, Jakupsstovu *et al*. (2001) undertook a large-scale study on catch rates around the Faroe Islands and found that although many fishers perceived a decrease in catch during seismic operations, analysis of logbook records during periods with and without seismic operations showed no significant effect of seismic activity on catch rates in the area.

Løkkeborg *et al.* (2012) found that during seismic activities on a Norwegian fishing ground, catch rates changed for all species studied, except for saithe. Gillnet catches for redfish and Greenland halibut increased by 86% and 132% respectively, compared to pre-activity levels. In contrast, longline catch rates fell (16% for Greenland halibut, 25% for haddock). These varied results were explained by greater swimming activity versus lowered food search behaviour in fish exposed to acoustic emissions. Acoustic mapping of fish abundance did not suggest displacement from fishing grounds, suggesting strong habitat preference in some species (Løkkeborg *et al.,* 2012).

Some studies clearly demonstrate a reduction in catch-per-unit-effort near seismic operations. Such effects are usually temporary and localised, generally lasting from one to five days following the cessation of seismic activity. For example, Bendell (2011) analysed long-line catches off the coast of Norway during the acquisition of a two-week seismic survey with a peak source level of 238 dB re 1 µPa@1 m. Catch rates reduced by 55 – 80% within the survey area for distances up to 5 km from the active source; however, these reductions were temporary with catch rates returning to normal within 24 hours of the seismic operations ceasing. There are no studies reporting evidence of long-term displacement in commercially fished species.

In studies where reductions in catch rates occur in conjunction with MSSs, it can often be difficult to conclusively attribute a change in catch rate to the impacts of such exposure. For example, Engas *et al*., (1996) investigated the abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) in the central Barents Sea seven days before, five days during, and five days after seismic acquisition. The authors found that trawl catches of cod and haddock and longline catches of haddock declined, on average, by 50% after acquisition started and longline catches of cod reduced by 21%. Catch rates did not return to pre-survey levels during the five-day period after seismic acquisition ended. These authors hypothesised that the reduction in Atlantic cod and haddock catch rates reported from commercial longlines and trawls was most likely due to fish moving away from the seismic area (Engas *et al*., 1996); however, Skalski *et al*. (1992) argued that it may have been due to decreased responsiveness to baited hooks associated with an alarm behavioural response, or impacts related to fishing the same area for over two weeks. Some authors (e.g. Gausland, 2003) also argue that reductions in catch may represent natural fluctuations in fish stocks or long-term negative trends.

It is acknowledged that acoustic emissions from the Otway Basin 3D MC MSS may have localised and short-term effects on the behaviours of target fish species, but behaviours and catch rates are expected to return to normal shortly after the acquisition ceases. The potential extent of impacts to catch rates is unlikely to be detectable beyond the area where physical displacement of fishing vessels by the seismic vessel and towed array occurs (see **Section 7.1.3.1**). In the even that commercial fishers do experience a loss in catch due to the Otway Basin 3D MC MSS, they may submit claims to TGS for compensation (see **Table 87**).

Southern Bluefin Tuna Fishery

Given the limited hearing capabilities and sensitivity of tunas to anthropogenic noise, it is reasonable to assume that significant behavioural effects may only occur in SBT when fish are exposed to seismic acoustic emissions at relatively close ranges to the source (in the order of hundreds of metres to a few kilometres) and that any effects will be temporary and short-lived in duration (e.g hours). This is supported by observations made during the TGS Nerites Phase 1 MSS in 2014 where schools of tens or hundreds of SBT were observed within less than 1 km of an operating 4,100 cui acoustic source, displaying normal swimming and feeding behaviour at the surface, indicating limited or no long-range avoidance or change in behaviours.

Some change in distribution of juvenile SBT may also occur as a secondary effect to the disturbance of schools of sardines and other prey fish species, with the resultant localised change in distribution of prey resulting in SBT looking for prey and feeding in areas further from the area of seismic acquisition than they would do otherwise.

The SBTF consists of the purse-seine fishery and long-line fishery; only the long-line fishery has reported catch for within the AA/OA. Following catch within the purse-seine fishery, tuna are transferred to tow cages for the ranching industry which operates in South Australian waters. Divers are employed to assist with this, however, divers associated with the SBTF will not be affected by acoustic emissions from the Otway Basin 3D MC MSS on account of the distance of the AA/OA from these operations.

TGS acknowledge that acoustic emissions form the acoustic source may disturb SBT at close range. Following consultation with tuna representatives, TGS defined a SBT Assessment Area within which several additional control measures would be implemented. However, the OA has subsequently been refined, with the boundaries of the OA retracting back from the South Australian waters targeted by SBT fishers. Although the SBT Assessment Area is no longer considered to be required, several of the additional control measures that were proposed for the Otway Basin 3D MC MSS around SBT will still be adopted as standard practices. Control measures for SBT have been described in **Section 7.1.3.1.1.6** and **Table 84**.

Southern Squid Jig Fishery

Fishing effort and catch in the SSJF is highly variable and largely depends upon the demand and market price of Gould's squid. High intensity fishing effort has previously occurred to the north of the AA, offshore from Portland, in some years but not in others. Past fishing effort has also included waters off western TAS (see **Section 4.7.3.2.3**.

La Bella *et al*. (1996) looked specifically at the effect of MSSs on squid fishing catch in the central Adriatic Sea. The study concludes that no apparent changes in trawl catches were found in short-finned squid (*Illex coindetti*) the day after an MSS, where the acoustic source had a SPL of 210 dB re 1µPa, deployed at 1 m (corresponding to levels of 149 dB re 1µPa at the animals' location).

Gould's squid typically occur in water depths less than 600 m. Therefore, their distribution is limited to waters largely inshore of the 3D AA and in the 2D tie line AA. Based on the avoidance response sound exposure level of 162 dB re 1µPa^2.s reported by Fewtrell and McCauley (2012), the results of the UAM (Welch *et al*. 2023; **Appendix B**) predicts a startle response may occur between 1.05 – 2.34 km from the seismic source, when operating adjacent to areas where squid may be present, with potential increased swim speeds and avoidance over greater distances. However, any avoidance is likely to be negligible in the context of the variable distribution and natural movements of these highly mobile pelagic organisms. Therefore, impacts to catch (should fishing effort occur in the same location and at the same time as seismic acquisition) will be limited.

State-managed Giant Crab and Rock Lobster Fisheries

While the impact assessment to invertebrates predicts that there is potential for sub-lethal effects to crustaceans within 157 m and 238 m from the seismic source on the upper continental slope and along the 2D tie line respectively, the sub-lethal effects reported in studies by Day *et al*. (2016a, 2016b, 2017, 2019) on southern rock lobster included statocyst impairment and reduced tail flip/righting times. However, some of the control lobsters used in the experiments were collected from a marine reserve and were found to have a high level of pre-existing impairment to statocysts similar to that induced by the seismic exposure experiments due to long-term exposure to shipping noise. Monitoring of the lobster population at the same reserve where the lobsters with pre-existing statocyst impairment were taken from showed that the rock lobster population within the reserve was thriving and at carrying capacity and were able to climb into pots and be caught (Green and Gardner, 2009; Kordjazi *et al*., 2015).

Parry and Gason (2006) examined catch rate data for the southern rock lobster and found no significant effects of MSSs on commercial catch rates in western VIC, Australia between 1978 and 2004. During this time multiple MSSs had occurred in the area: 28 2D surveys and five 3D surveys. In this study, the number of seismic pulses was correlated to catch per unit effort data over 12 depth stratified regions. Catch per unit effort data detected no significant change in catch rates during the weeks and years following MSSs, leading the authors to conclude there was a lack of apparent impact on rock lobster fisheries from MSSs in that region.

Steffe and Murphy (1992) analysed historical catch data for king prawns before, during and after MSS operations off Newcastle, NSW, Australia. They concluded that there were no significant differences in pre-, during and post-survey catch rates and could not detect any impact on offshore prawn catches that were attributable to the MSS. However, these authors did not statistically analyse the catch data and details of the MSS (source type, source level, exposure level, exposure duration) were not provided.

Internationally, Andriguetto-Filho *et al*. (2005) found that the catch rates of the southern white shrimp (*Litopenaeus schmitti*), southern brown shrimp (*Farfantepenaeus subtilis)* and Atlantic seabob (*Xyphopenaeus kroyeri)* were unchanged during a MSS (peak source level 196 dB re 1 µPa at 1 m). These authors concluded that the results suggest that shrimp stocks are resilient to disturbance by seismic acoustic sources under experimental conditions.

Christian *et al*. (2003) found that catch rates of snow crabs (*Chionoecetes opilio*) in Newfoundland were higher following exposure to a seismic source, but noted that this was probably due to physical, biological or behavioural factors unrelated to the acoustic source.

Concerns from snow crab harvesters in Atlantic Canada that seismic noise from widespread hydrocarbon exploration was having negative effects on catch rates led Morris *et al*. (2018, 2020) to undertake a BACI study to examine the effects of industry-scale seismic exposure (2D seismic – Morris *et al.,* 2018) and 3D seismic (Morris *et al.,* 2020) on catch rates. The study area and methodology were developed following consultation with industry-based snow crab harvesters and seismic surveying industries to ensure that the study design aligned with industry standards and was realistic. Results showed no evidence of negative effects of seismic activity on catch rates over both short (within days) and longer (over weeks) time frames. Significant differences in catch rates did occur across study areas and between years; however, it was concluded that, if seismic effects on snow crab harvests did exist, the magnitude of these effects was smaller (and less important) than changes related to natural spatial and temporal influences (Morris *et al*., 2018, 2020).

The 3D AA is 510 m deep at its shallowest point, but for the most part, the northern and eastern boundaries of the 3D AA are in water depths greater than 700 m depth. The 3D AA therefore avoids the core depth range and habitat preference of giant crab (<400 m), with limited spatial overlap with the deeper limits of giant crab habitat (<820 m). Limited effects may occur in the shallowest extents of the AA, mainly limited to the single 2D tie line that may be acquired (water depth 115 m). Similarly, the AA has limited overlap with rock lobster fishing grounds; these are primarily limited to continental shelf waters, though some lobster fishing occasionally occurs in the deeper waters of the upper slope.

Due to the limited overlap with the habitat and core fishing ground for giant crab and rock lobster, and the limited effects of noise on the target species, no long-term impacts to catch rates is predicted. As a further precautionary measure, acknowledging that the TAS giant crab stock is currently assessed as Depleted, TGS propose to exclude operation of the seismic source in water depths less than 1,000 m in waters to the south of the 2D tie line AA (**Figure 74**).

Commercial Fisheries Compensation Protocol

TGS will implement a commercial fisheries compensation protocol to manage potential impacts from the Otway Basin 3D MC MSS on the commercial fishing industry in Australian waters. In the event that impacts from the Otway Basin 3D MC MSS cannot be managed or avoided, and commercial fishers experience an economic loss as a result of the Otway Basin 3D MC MSS, then financial compensation will be considered, in accordance with TGS' Commercial Fisheries Compensation Protocol. TGS' compensation protocol will be finalised prior to the Otway Basin 3D MC MSS commencing.

All claims submitted by commercial fishers[32] will be considered on a case-by-case basis. A compensation claim would only be relevant for the following occurrences:

- Interaction resulting in loss or damage to fishing equipment;
- A temporary loss of fish landed catch due to damaged or lost fishing equipment;
- Where displacement from fishing grounds results in additional costs incurred due to relocating; or
- A temporary reduction in fish landed catch due to the effects of acoustic emissions or displacement from fishing grounds. Displacement from fishing grounds can be as a result of operational activities during the Otway Basin 3D MC MSS, and as a result of avoiding contaminated waters following a fuel oil spill.

For any licence holder to be eligible for compensation, all claimants must provide notification of their intent to submit a claim within 30 days of any equipment being lost or damaged, and/or being displaced from their 'usual fishing grounds'[33]. An application form for a compensation claim will be available as part of the compensation protocol and will detail all the requirements that the claimant must address for any potential losses a licence holder may incur (as listed above). A completed compensation claim application form must be submitted to TGS within 12 months of notifying TGS of the intention to submit a claim. Claimants can provide notification of their intent to submit a claim and submit a completed compensation claim application form to otway@TGS.com.

Each completed application will be assessed to determine the merit of the claim. In doing so, consideration will be given to the circumstances giving rise to the claim, including whether the circumstances could have been reasonably avoided. TGS will communicate the outcome of the claim to the claimant (or request clarification or additional information from the claimant) as soon as practicable and within 30 days after receiving the application. If the claim is assessed to have merit, and compensation is recommended, payment will be made directly to the claimants nominated bank account within 60 days of the claim determination.

The commercial fisheries compensation protocol will apply to the waters located within the OA, and any additional area of avoidance requested around the Seismic Vessel and towed survey equipment. The commercial fisheries compensation protocol will also apply during the period of Otway Basin 3D MC MSS operations only.

Subject to a claim being lodged, TGS will, at their expense and in consultation with the claimant, engage a suitably experienced and qualified independent person or organisation[34] as the assessor to the claim. The assessor will prepare an assessment report to TGS outlining the following information:

- A copy of the letter of instruction and project brief received by the assessor (from TGS) when engaged to carry out the independent assessment;
- Conformation (or otherwise) the information provided in the claim is sufficient to conduct a meaningful assessment;
- A summary of the claim details (survey, applicant, vessel, month/s);

[32] Defined within the Commercial Fisheries Compensation Protocol as 'the entity person, licence holder, company or affected business who would have received the revenue from the landed catch that is subject of a claim under the protocol, or who can show they have incurred the cost of lost or damaged fishing gear or displacement'.
[33] Defined as '*an area where fishing activity has been recorded by the commercial fishing licence holder on government statutory fishing returns for at least two out of the previous five years*'.
[34] Defined as '*a person or organisation with proven demonstrated experience in data analysis and data auditing processes and procedures within the industry*'.

- For a loss of catch claim, monthly CPUE assessments as outlined in the commercial fisheries compensation protocol, including an estimation of any loss of catch (in kg) and its market price; and
- Any other information, comments, or views relevant to the assessment that the assessor may wish to include.

If a claimant disputes the nature of the evidence to be provided, the outcome of the claim assessment, or the payment amount, and agreement cannot be reached with TGS, the claimant may, within 30 days, request that a suitably experienced and qualified independent third-party is engaged to review and determine the outcome of the claim. The costs of engaging the independent third-party will be covered by TGS.

Summary of known and potential impacts on commercial fisheries

Overall, the effects of underwater noise during seismic acquisition are expected to have localised and short-term effects on target species. Depending on the target species, these effects may extend from a few tens of metres to a few kilometres from the source, and literature reviewed suggests affects could last for minutes, hours of days after the Otway Basin 3D MC MSS. Behavioural effects may result in some local changes to the distribution of target species, particularly mobile pelagic species. However, the resultant extent of displacement or impacts to catch levels is expected to be limited to the AA and is not broadly comparable to the area where fisheries would be displaced by the physical presence of the seismic vessel and towed equipment (**Section 7.1.3.1**).

In acknowledgement on the potential impacts of acoustic emissions on commercial fisheries that overlap with the OA/AA for the Otway Basin 3D MC MSS, TGS has developed a Commercial Fisheries Compensation Protocol whereby fishers whose catch are affected by acoustic emissions during the Otway Basin 3D MC MSS can submit a claim for compensation, to be assessed by an independent third-party assessor. This protocol will ensure that the Otway Basin 3D MC MSS is undertaken in a manner that prevents any increased cost encumbrance or loss of income to commercial fishing licence holders.

The potential overlap with commercial fisheries is considered to be negligible, such that any localised and short-term behavioural effects to target fish species at the periphery of their respective fishing grounds is not expected to have a discernible impact on catch rates; with any effects to be localised and only short-term disruptions to normal activities as well as minor adverse effects no natural resources expected. Based on available evidence, it is considered unlikely (uncommon but has been known to occur elsewhere) acoustic emissions from the Otway Basin 3D MC MSS may result in changes to commercial catches to occur. As such, the residual risk of negative impacts to commercial fishery catches due to exposure to acoustic emissions associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Unlikely*) (**Table 49**).

7.2.3.2 Evaluation of Known and Potential Impacts and Risks on Commercial and Recreational Dive Operations

Underwater, the human ear is about 20 dB less sensitive than it is in air at low frequencies (20 Hz), increasing to 40 dB at mid-frequencies (less than 1 kHz), and increasing to 70 – 80 dB less sensitive at higher frequencies (Parvin, 1998). Divers who wear neoprene hoods have even higher hearing thresholds (i.e. a lower sensitivity) above 500 Hz as the hood material absorbs high-frequency sounds (Anthony *et al*., 2010). Exposure studies related to divers have typically focused on military sonar exposure, with little information on seismic survey operations, and as such care is required when considering thresholds for non-military divers, particularly for impulsive sounds such as seismic source impulses (Ainslie, 2008).

Underwater auditory threshold curves indicate that the human auditory system is most sensitive to waterborne sound at frequencies between 400 Hz to 1 kHz (Parvin *et al*., 1994), and these frequencies have the greatest potential for damage. Within the literature (all as cited in Ainslie, 2008), there is some variation in acceptable SPLs for divers.

The auditory threshold of hearing underwater was lowest at 1 kHz (70 dB re 1 µPa SPL) and increased for lower and higher frequencies to around 120 dB re 1 µPa at 20 Hz and at 20 kHz (Parvin, 1998). Fothergill *et al*. (2000) and Fothergill *et al*. (2001) conducted controlled acoustic exposure experiments on military divers under fully controlled conditions at a US Ocean Simulation Facility and an US Open water test facility. The following exposure limit for both military and recreational divers was suggested as a conservative measure: for frequencies between 100 and 500 Hz, the maximum SPL should be 145 dB re 1 µPa over a maximum continuous exposure of 100 seconds or with a maximum duty cycle of 20% and a maximum daily cumulative total of three hours. The trading relation between the maximum SPL and duration was 4 dB per doubling of duration (e.g. 141 dB SPL for a 200 second exposure) (Pestorius *et al.,* 2009).

In alignment with these studies, and considering only frequencies between 100 and 500 Hz, Parvin (2005) suggested 145 dB re 1 µPa SPL as a safety criterion for divers. Seismic airgun sources are broadband sources, and therefore, for this assessment the most precautionary and conservative diver acoustic impact threshold is the 145 dB re 1 µPa SPL suggested by Parvin (2005). This does not imply that this level is associated with the onset of injury but represents a conservative level for protection against prolonged sound exposure for health and safety purposes.

Effects of noise on human divers range from dizziness, disorientation, temporary paralysis of limbs, or TTSs, to PTSs, severe pain, and haemorrhaging of soft tissues (Cudahy and Parvin, 2001). For sounds with frequencies of 500 – 2,500 Hz, Parvin (2005) reported temporary dizziness and related symptoms for bareheaded divers exposed to sound levels above 176 dB re 1 µPa, and vibration in forearms and thighs at sound levels above 180 dB re 1 µPa. Sounds were tolerated up to 191 dB re 1 µPa (the maximum used in the trial); however, from these results a threshold exposure level for human divers of 145 dB re 1 µPa was proposed for 100 – 500 Hz frequencies, and 155 dB re 1 µPa for 501 – 2,500 Hz.

In 2020 the Diving Medical Advisory Committee released Rev 2.1 of '*Safe Diving Distance from Seismic Surveying Operations*' Guidance Note which extended the threshold distances stated in previous revisions of the Guidance Note, with the following guidance (among others):

- Plans should be made to avoid overlapping seismic and diving activities; where this is not possible, the activities should be prioritised and a simultaneous operations plan developed;
- Where diving and seismic activity are schedule to occur within a distance of 45 km, it is good practice for all parties to be made aware of the planned activity where practicable, including clients/operators, diving and seismic contractors;
- Where diving and seismic activity will occur within a distance of 30 km a joint risk assessment should be conducted between the clients/operators involved in the seismic and diving contractors in advance of any simultaneous operations;
- The maintenance of effective communication and cooperation between the seismic vessel and the diving vessel is essential;
- Minimum safe distances should not be compromised by either party; and
- Should any diver in the water experience interference with communications, the noise level is considered to exceed acceptable exposure levels, feels sudden discomfort, or places the diver at risk in any other way, the diver's exposure should be terminated.

Diving activities in the region have been identified as recreational diving and abalone diving in coastal waters. These activities, undertaken using SCUBA or hookah equipment, are typically located in coastal waters up to 30 m depth. As outlined within **Section 4.7.2**, recreational diving will be concentrated in coastal waters at popular diving destinations such as Apollo Bay, Port Campbell, and Neptune Islands. The closest areas of coastal waters in depths diveable by recreational and abalone divers (i.e. 30 m or less) are limited to a stretch of water from Portland (VIC) to Beachport (South Australia). Based on the acoustic modelling (Welch *et al*. 2023), maximum-over-depth ranges to exceedance of the 145 dB re 1 µPa SPL criteria at modelling sites on the shelf edge off South Australia and VIC were between 12.5 and 30.2 km inshore towards coastal waters. The 30 m depth contour is over 27 km inshore of the AA, therefore the 145 dB re 1 µPa criteria is not expected to be exceeded. However, based on the guidance within the *Safe Diving Distance from Seismic Surveying Operations*' Guidance Note outlined above, as a precautionary approach, TGS will conduct a joint risk assessment and planning/mitigation between parties where diving operations will occur within 30 km, and will make all parties aware of the Otway Basin 3D MC MSS where diving and seismic activities will occur within 45 km of each other. TGS has made all efforts to consult with recreational divers that may utilise the coastal waters inshore of the OA (see **Section 5**).

Offshore oil and gas installations are typically noisy above and below water; therefore, commercial divers working around the offshore facilities are already exposed to high levels of noise (Anthony *et al*., 2010). Dive operations at these installations are routinely carried out for inspection and maintenance works and may occur while the Otway Basin 3D MC MSS is operating. The closest producing field from the AA is the Thylacine Platform, approximately 8 km from the AA (and within the OA). Installation operators will be kept updated throughout the programme with the 48-hour look-ahead so that they may schedule any dive operations as they deem appropriate to ensure the safety of their divers as they undertake their own risk assessment as part of their diving procedures. TGS will be in regular contact with gas installation operators who will be able to schedule dive operations as they deem appropriate.

TGS has undertaken an extensive consultation programme during the preparation of the EP and has identified several dive operators that are of relevance to the Otway Basin 3D MC MSS including recreational and commercial (petroleum operators and abalone fishers) dive operators (**Section 5**). To date, there have been no concerns raised by recreational fishers with regard to dive operations. Commercial abalone divers have raised concerns regarding the potential effects of seismic emissions on abalone habitat, but not concerns for divers in the water. Due to the distance offshore of the OA from dive-able abalone habitat (<30 m), there will be no effects of acoustic emissions on abalone habitats or abalone divers. Full correspondence is provided in **Appendix H**.

Based on the above, and the control measures in place (**Table 84**), the potential residual risk to divers from noise emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Rare x Minor*).

7.2.3.3 Evaluation of Known and Potential Impacts to UXOs and Defence Activities

The OA covers four areas identified by the Department of Defence as containing UXOs: SDG110, SDG136, SDC006, and 1052 (**Figure 70**). These areas were used for the dumping at sea of ammunition (including detonators and explosives), chemical munitions, and as an air-to-air firing range. SDC006 is of note as a dumping area for chemical munitions, i.e. mustard gas.

During World War II, Australia held stocks of Chemical Warfare Agents (**CWA**) to be used in retaliation to CWA used by the Japanese. None of the stockpiled CWA munitions were used during combat, leading to the need for disposal of CWAs. "*Drowning at sea at 500 fathoms (915 m)*" was determined to be the only feasible method of destruction (Plunkett, 2003) as disposal at sea was considered to be safe and convenient (Greenberg *et al*., 2016). Evidence suggests that most of Australia's CWA stocks were disposed of in this manner (Plunkett, 2003). It is considered that most of the disposed CWA material will have sunk close to the dump position where it would be buried by sediment or encrusted by marine organisms; however, due to surrounding currents there would have been some drift of lighter material away from the dump site. Some UXO may also no longer exists, having fully dissolved, rotted, or corroded (Plunkett, 2003).

Over time, the cylinders within which the UXOs were disposed are known to corrode, releasing the contained CWA into the surrounding marine environment. For example, in the 1950s, severe metal corrosion was evident in recovered munition casings a few years after dumping at sea had occurred (Greenberg *et al*., 2016), and WWII munitions that had been disposed of in the Baltic Sea and subsequently netted by fishermen between 2000 and 2005 were completely corroded (HELCOM, 2005). Corrosion rate will, however, be site specific due to differing environmental variables.

Although the water solubility of mustard gas is relatively low, dissolved components rapidly hydrolyse to form thiodiglycol and thioxane, with the formation of intermediate sulphur compounds in small amounts (Munro *et al*., 1999). Thiodiglycol is the most toxic degradation by-product and is a mild irritant with low acute and chronic toxicity potential (Reddy *et al*., 2005; Bizzigotti *et al*., 2009). Over time, mustard gas exposed to ocean water forms a solid concretion, with an outer polymer crust of intermediate breakdown products which increases its persistence in the marine environment (Munro *et al*., 1999); however, various environmental variables aid breakdown such as higher temperatures, water flow, and mechanical disruption (i.e. movement along the sea floor) (Greenberg *et al*., 2016). There are several naturally occurring sediment microorganisms that can break down CWAs (Medvedeva *et al.,* 2009), this biodegradation further enhances the breakdown of these materials and the removal of the toxic components (Sanderson *et al.,* 2010). These microbes can mineralise the degradation by-products even at low temperatures; hence they are thought to contribute significantly to dumpsite decontamination (Medvedeva *et al*., 2009). Furthermore, microbial action typically reduces the timescale over which CWAs are considered to be an environmental threat to <100 years (probably closer to 50 years); by which time the toxic components are expected to be significantly hydrolysed and mineralised (Sanderson *et al*., 2010).

Despite the high volumes of CWAs dumped worldwide, there is a paucity of information on the aquatic toxicity of mustard gas and its degradation products (Czub *et al*., 2020), although direct contact with mustard gas is known to be toxic for humans, terrestrial mammals, and fish (Czub *et al.,* 2020). Evidence suggests that it rapidly penetrates cells and (via damage to DNA, RNA and proteins) affects a variety of cell functions (Papirmeister *et al.*, 1991). Lang *et al*. (2014) investigated the health of cod (*Gadus morhua*) at CWA dumpsites in the Baltic Sea and concluded that there was no indication of significant generic health effects in cod from dump sites compared to reference sites, although fish communities within the dump site were regarded as stressed. In contrast, Stock (1996) stated that mustard gas has no significant effects on fish and fish do no bioaccumulate this agent (as described in Plunkett, 2003).

Acoustic sources produce short duration, predominantly low frequency noise with high peak source levels. The acoustic pulse forms a steep-fronted wave that is transformed into a high-intensity pressure wave. This pressure wave is essentially a shock wave with an outward (i.e. horizontal) flow of energy in the form of water movement. In addition to this horizontal pressure wave, the sea floor directly underneath the active seismic source will be subject to both the downward going incident signal and its upward going reflection from the seafloor (Duncan, 2016).

While little information is available about how pressure levels impact solid structures on the seafloor, research indicates that soft bodied benthic organisms directly in the path of an active seismic survey are largely unaffected by exposure at a cellular level. For example, Carrol *et al*. (2017) conducted a comprehensive literature review of the potential impacts of low-frequency seismic sound on the physical and physiological attributes or marine organisms and reported no tissue or organ damage for bivalves or fish at either realistic or unrealistic seismic exposures. It is reasonable to assume that solid objects on the seafloor, such as the munition casings dump sites, will be substantially more robust to exposure than living organisms and would therefore be unlikely to sustain any damage on account of the acoustic pressure waves generated during marine seismic surveys.

It is noteworthy that seismic surveys are often used to map the underlying substrate of the seafloor in areas where submerged pipelines exist (e.g. in producing oil and gas fields). Indeed, Sanderson *et al*. (2010) conducted extensive seismic mapping of the largest CWA dumpsite in the Baltic Sea (in water depths of 70 – 96 m) as part of a study into the potential environmental effects of legacy contaminants which were dumped following WWII.

The potential for seismic emissions to damage the casings containing the mustard gas was raised during consultation with relevant persons, therefore, as a precautionary control measure around UXOs, TGS will implement an Acoustic Exclusion Area of 3 NM around the centre point of UXO site SDS006 within which there will be no activation of the acoustic source (**Figure 84**). This site was an area of chemical munitions dumping (mustard gas).

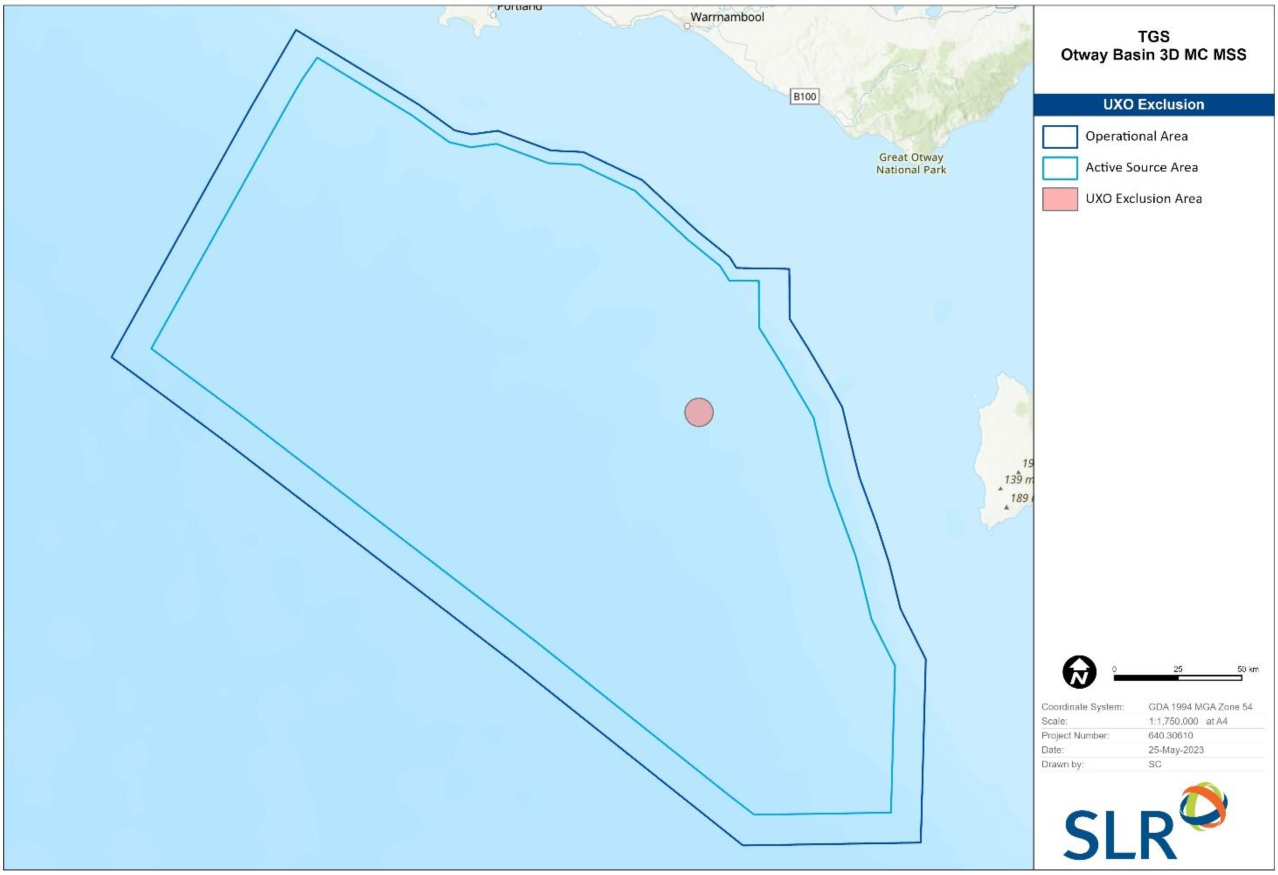


Figure 84 UXO SDS006 Acoustic Exclusion Area

TGS has consulted with the Department of Defence as a relevant person throughout the preparation of this EP who advised that part of the proposed OA is located within the South Australian Exercise Area and restricted airspace, and that UXO may be present on the seafloor. It was advised that all activities are conducted at TGS' own risk, and that the Commonwealth of Australia takes no responsibility for reporting the location and type of UXO that may be in the area, identifying or removing any UXO from the area, and any loss or damage suffered or incurred by TGS or any this part arising out of, or directly related to UXO in the area.

In order to ensure that activities associated with the Otway Basin 3D MC MSS, TGS will provide ongoing notification of activities prior to and during the Otway Basin 3D MC MSS and will ensure that any activities undertaken within the restricted airspace comply with the Notice to Airmen restrictions, including liaison with the airspace controlling agency if restricted airspace is activated (e.g. during periodic aerial surveys).

Based on the above, the residual risk to UXO and defence activities arising from acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Remote*).

7.2.3.4 Evaluation of Known and Potential Impacts to Heritage Values

TGS has identified four shipwrecks within the OA (**Figure 46**) that will be subject to acoustic emissions during the Otway Basin 3D MC MS. MSSs are regularly utilised to detect and map the extent of shipwrecks in the marine environment (e.g. Ward *et al.,* 1999; Grøn *et al*., 2015) and as a result there will be no impacts to the identified shipwrecks as a result of acoustic emissions from the Otway Basin 3D MC MSS.

The residual risk to heritage values (i.e. shipwrecks) arising from acoustic emissions during the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible x Rare*).

7.2.4 Decision Context

The decision context for Acoustic Disturbance to the Marine Environment has been assessed as Type B, although the uncertainty is minimal, given the greater complexity associated with the predicted impacts and risks. The level of interested raised by relevant persons regarding predicted impacts to commercial fisheries, marine mammals and protected areas is consistent with this characterisation.

7.2.5 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

The control measures that will be implemented during the Otway Basin 3D MC MSS to manage the impacts from acoustic disturbance to **ALARP** have been included in **Table 84**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction (**Table 84**), based on a Hierarchy of Controls methodology **Table 83**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 83 Hierarchy of Control Measures for Acoustic Disturbance to the Marine Environment

Eliminate	Noise emissions are a fundamental requirement of any MSS in order to produce the detailed geological images and meet survey objectives. As a result, noise emissions cannot be eliminated.
Substitute	Alternative data acquisition methods are not yet commercially available or proven to meet geophysical data quality objectives, operational safety, and reliability requirements. Therefore, no practicable substitutes are available.
Reduce	The maximum capacity of the acoustic source has been designed to be as low as possible while still maintaining the ability to meet survey objectives. Survey operations will run 24/7 (where possible) to reduce the total duration of the Otway Basin 3D MC MSS. The acoustic source will not be operated in waters outside of the OA, and deployment and retrieval of the acoustic source will only occur within the bounds of the OA to ensure there is no accidental discharge of the acoustic source outside of the OA.
Mitigate	Control measures have been assessed within **Table 84** in order to mitigate the impacts from noise emissions to **ALARP** levels. Those which are appropriate and are not impracticable or unfeasible (**Table 84**) will be implemented for the duration of the Otway Basin 3D MC MSS.

Table 84 Assessment of Control Measures for Managing the Acoustic Disturbance to the Marine Environment

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of routine permissible waste discharges.	Yes
Adherence to Policy Statement 2.1 requirements, through the implementation of the following control measures with respect to all whales (baleen and toothed), throughout the entire OA for the duration of the Otway Basin 3D MC MSS: • Observation zone[AC 35]: 5+ km horizontal radius from the acoustic source; • Shut-down Zone[AC]: 2 km horizontal radius from the acoustic source; • Crew training: Crew are trained in the basic requirements of Policy Statement 2.1 prior to the survey commencement and will also be familiar with the commitments in this EP; • Pre-start-up Visual Observations (daylight hours): 30 minutes prior to the commencement of Soft-start Procedure; • Soft-start Procedure: Commences only where no whales have been sighted within Shut-down Zone over a 30 minute Pre-start up Visual Observation period; • Start-up Delay Procedures: Will be implemented if a whale enters the Shut-down Zone during the soft-start; • Stop Work Procedures: Will be implemented whenever a whale is detected in the Shut-down Zone; • Night-time and Low Visibility Procedures: Will be implemented throughout periods of low visibility, including night-time, under rough seas or fog; • Compliance and Sighting Reports.	P = Yes E = Effective	Adherence to Policy Statement 2.1 is a legislative requirement. Further detail regarding the suite of control measures to be adopted in accordance with Policy Statement 2.1 has been provided below and within **Appendix M**. Note that the use of a 5+ km Observation Zone goes above and beyond the requirements of the standard management procedures outlined in Policy Statement 2.1. In the case of the Otway 3D MSS, an extension to the Observation Zone is warranted because of the high likelihood of encountering whales during the proposed survey. The distance of 5 km was selected on the basis that blue whale detection can be reasonably expected to 5 km over a range of sighting conditions, and several other whale species will be visible over this range (e.g. southern right whales, humpback whales, sperm whales, fin whales, sei whales). The use of a 2 km Shut-down Zone also goes above and beyond the requirements of the standard management procedures outlined in Policy Statement 2.1. Additional controls presented within the Legislative Requirements section, to assist in understanding the implementation of the total suite of whale management measures, are marked with AC superscript (e.g., control[AC]).	Yes
Policy Statement 2.1: Precaution Zones: • Observation Zone[AC]: 5+ km horizontal radius from the acoustic source; • Extended Observation Zone for BW/PBW and SRWs; • Shut-down Zone[AC]: 2 km horizontal radius from the acoustic source; • An Extended 7 km Shut-down Zone[AC] for BW/PBW and SRWs; and Shutdown at any distance for a SRW mother-calf pair.	P = Yes E= Effective	Precaution Zones are set based on the likely sound levels surrounding the acoustic source as demonstrated by acoustic modelling. The use of Precaution Zones provides the basis for the mitigation measures throughout Policy Statement 2.1 and defines the zones where certain operational procedures will be implemented (e.g. shut-downs of the acoustic source when a whale enters/is sighted within the Shut-down Zone). In addition to the standard Precaution Zones prescribed within Policy Statement 2.1, for surveys exceeding received sound exposure levels of 160 dB re 1 µPa, additional Precaution Zones have been applied to protect PBW, SRW and 'other whales' based on the outputs of UAM or Animat modelling. The justification for additional Precaution Zones is further described in **Appendix M.** Additional Precaution Zones that will be implemented during the Otway Basin 3D MC MSS include: • Observation Zone[AC]: 5+ km horizontal radius from the acoustic source; • An Extended Observation Zone[AC] for BW/PBW and SRWs; • An Extended 2 km Shut-down Zone[AC] for 'other whales'; • An Extended 7 km Shut-down Zone[AC] for BW/PBW and SRWs; and • Shutdown at any distance for a SRW mother-calf pair. It is a legislative requirement to adopt this control measure; environmental benefit outweighs additional cost.	Yes

[35] Additional controls presented within the Legislative Requirements section, to assist in understanding the implementation of the total suite of whale management measures, are marked with AC superscript (e.g., control[AC]).

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Policy Statement 2.1: A.2 – Crew training (General crew).	P = Yes E= Effective	Vessel crew are required to have sufficient training in order to implement the mitigation procedures of Policy Statement 2.1. TGS will ensure that all crew are trained to understand the basic requirements of Policy Statement 2.1 and the specific Precaution Zones that will be implemented as part of the Otway Basin 3D MC MSS. Crew will be informed that they have a responsibility to report any opportunistic marine mammal sightings that they may make to an on-duty MFO. At the start of the survey a briefing will be provided to all crew on board all survey vessels on environmental matters, including information on Policy Statement 2.1, whale identification and the environmental legal obligations for companies operating in Australian waters. This will constitute an environmental induction on the EP and it's requirements. Reference material will be provided and made available for the duration of the survey onboard all survey vessels, including Policy Statement 2.1, the Department's Whale and Dolphin sighting report form and the APPEA CD Guide 'Search Australian Whales and Dolphins'. Appropriate visual aids such as binoculars will be available on board each survey vessel to aid in the identification and reporting of any marine mammals sighted. The MFOs will have primary responsibility for whale observation and compliance with the Precautionary Zones; however, trained crew will act in a support role by immediately reporting any opportunistic marine mammal sighting (from either the Seismic Vessel or any of the support vessels) to the on-duty MFO, and by assisting the MFO with any duties as requested. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes
Policy Statement 2.1: A.3.1 – Pre-start-up visual observations procedures. The 5+ km Observation Zone[AC] will be monitored for the presence of whales for at least 30 minutes before the commencement of a Soft-start Procedures.	P = Yes E= Effective	Pre-start up visual observations are required under Policy Statement 2.1. An Observation Zone[AC] of 5+ km will be monitored from the Seismic Vessel. The 5+ km Observation Zone[AC] will be monitored for the presence of whales for at least 30 minutes before the commencement of a Soft-start Procedure. The dedicated, trained, and experienced MFOs on both the Seismic Vessel and the Attending Support Vessel will have direct responsibility for undertaking pre-start-up visual observations and compliance with the Precautionary Zones, with trained crew (see above) support as required. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes
Policy Statement 2.1: A.3.2 – Soft-start procedures. Limits on when soft start procedures can commence will be applied for the duration of the survey as follows: • If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone[AC]; • If acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.	P = Yes E= Effective	Soft Start Procedures are a gradual increase of power over a set period with the intention of allowing adequate time for whales to leave the area before being exposed to the highest sound levels (Wright and Cosentino, 2015). They will also alert other marine fauna and allow them time to move away from the active source, avoiding potential physiological impacts. Soft-starts over a period of 30 minutes are a requirement of Policy Statement 2.1, where their implementation allows the power of an acoustic source to be gradually increased prior to the survey commencing which ensures that any whales that go undetected during pre-start-up observations have an opportunity to leave the vicinity of the acoustic array before full operational power is reached. The commencement of soft start procedures will be limited depending on whether or not acquisition occurred in the preceding 24 hours. If acquisition has occurred during this timeframe and no whale instigated shut downs were made, then soft starts may occur at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer. This provision is adopted on the basis that prior acquisition without sightings is indicative that the likelihood of whales going undetected in poor sightings conditions (night/low visibility) is low. However, if no acquisition occurred in the preceding 24 hours, then a more precautionary approach is warranted and soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone[AC.] Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Policy Statement 2.1: A.3.3 – Start-up delay procedures.	P = Yes E= Effective	During Soft-start Procedures in daylight hours, at least one MFO will be stationed on the bridge of the Seismic Vessel undertaking continuous visual observations for whales. If a whale enters a relevant Shut-down Zone (i.e., 7 km for BW/PBW and SRW; and 2 km for all 'other whales'), the acoustic source will be immediately shut-down. If the acoustic source is shut-down for an 'other whale' species, a soft-start procedure will only resume after the whale has been observed to move outside the 2 km Shut-down Zone[AC], or when 30 minutes has lapsed since the whale was last sighted within the Shut-down Zone. If the acoustic source is shut-down for a BW/PBW or SRW a soft-start procedure will only resume after the whale has been observed to move outside the 7 km Shut-down Zone[AC], or when 30 minutes has lapsed since the last BW/PBW or SRW sighting. The intention of these delays is to allow sufficient time for any whale/s to exit the Precaution Zones and avoid exposure to the highest sound levels. Start-up delays are a requirement of Policy Statement 2.1. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes
Policy Statement 2.1: A.3.5 – Stop work procedures. Stop work procedures will be implemented when: • Any 'other whale' enters or is detected in the Extended 2 km Shut-down Zone[AC;] • A BW/PBW enters or is detected in the Extended 7 km Shut-down Zone[AC]; • A SRW enters or is detected in the Extended 7 km Shut-down Zone[AC]; or • MFOs onboard the Seismic Vessel or the attending support vessel detect a SRW mother-calf pair at any distance.	P = Yes E= Effective	Stop work procedures are a requirement of Policy Statement 2.1. Stop work procedures will be implemented when: • Any 'other whale' enters or is detected in the Extended 2 km Shut-down Zone[AC;] • A BW/PBW enters or is detected in the Extended 7 km Shut-down Zone[AC]; • A SRW enters or is detected in the Extended 7 km Shut-down Zone[AC]; or • MFOs onboard the Seismic Vessel or the attending support vessel detect a SRW mother-calf pair at any distance. This control measure will be implemented by dedicated, trained and experienced MFOs that will be onboard the Seismic Vessel and Attending Support Vessel for the duration of the Otway Basin 3D MC MSS. After any 'other whale' has been observed to have left the Shut-down Zone or has not been detected for 30 minutes, start-up procedures can commence again. Following BW/PBW and SRW shut-downs, vessel relocation is required before start-up procedures can recommence. The details of these relocation requirements are provided later in this table where the specific controls for these species are described. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes
Policy Statement 2.1: A.3.6 – Night-time and low visibility procedures. During these periods, operations may proceed provided there have not been three or more whale instigated power-down or shut-downs during the preceding 24-hour period. Commencement of soft-start procedures at night or during periods of low visibility will be limited to circumstances when: • Acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period; and • May only occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer. The following additional criteria in relation to BW/PBW or SRW shut-downs must also be satisfied before night time and low visibility operations can occur: • Low Visibility or Night-time Operations may occur provided that no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).[AC] • Low Visibility or Night-time Operations may occur provided the no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).[AC]	P = Yes E= Effective	Specific night-time and low visibility procedures are a requirement of Policy Statement 2.1. They allow the MSS to continue throughout periods of reduced/low visibility (e.g. night-time, or periods of rough seas or fog). During these periods, operations may proceed provided there have not been three or more whale instigated power-down or shut-downs during the preceding 24-hour period. Generally speaking, TGS has adopted the threshold of three or more whales based on what was recommended within Policy Statement 2.1 Standard Management Procedures. However, given the proximity to the BW BIAs and the SRW Ag BIA, a more conservative threshold has been set for these species, and additional controls regarding the commencement of soft start procedures at night or during periods of low visibility will also apply[AC]. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Policy Statement 2.1: A.4 – Compliance and Sighting Reports. All cetacean sightings will be recorded in the 'Cetacean Sightings Application' software.	P = Yes E= Effective	A report on the conduct of the Otway Basin 3D MC MSS and any whale interactions will be provided to the DoEE within two months of survey completion following the minimum content recommendations in Policy Statement 2.1. All cetacean sightings will be recorded in the 'Cetacean Sightings Application' software. Legislative requirement to adopt control measure; environmental benefit outweighs additional cost.	Yes
Good Practice			
The minimum source size to acquire the survey data and meet the geophysical objectives of the Otway Basin 3D MC MSS has been selected. The acoustic source size used will not exceed that which has been modelled (3,480 in^3) and for which the predicted impacts and risks have been assessed. If the source used for the Otway Basin 3D MC MSS differs to that modelled in the EP, additional modelling will be undertaken.	P = Yes E = Effective	The acoustic source volume has been intentionally selected as it is considered to be the minimum source size identified to meet the geophysical objectives of the survey, taking into account the water depth, the depth of the geophysical targets and the properties of the underlying geology The sound propagation which will arise as a result of the acoustic source generation has then been modelled. The outcomes of this modelling are required to inform the environmental impact and risk assessment and ensure the activity is adequately managed. The maximum modelled zero to peak sound pressure level from the triple 3,480 in^3 acoustic source will be 258.3 dB re 1 µPa @ 1 m. If the acoustic source used for the Otway Basin 3D MC MSS differs to that modelled in the EP (i.e. within Welch *et al*., 2023, **Appendix B**), additional modelling will be undertaken prior to the commencement of the Otway Basin 3D MC MSS to confirm that the far-field horizontal source level specifications of the selected seismic source are consistent with those assessed in the EP and that the control measures and EPSs adopted for the Otway Basin 3D MC MSS are appropriate and manage potential impacts to ALARP and Acceptable Levels. Changes will be documented as per the Management of Change requirements. Good industry practice, environmental benefit outweighs additional cost.	Yes
Towed equipment will be retrieved when the Seismic Vessel is in transit to and from the OA (e.g. to and from port).	P = No E =Effective	Retrieval of towed equipment would reduce the potential for more coastal species interacting with the towed equipment whilst in transit and will minimise the spatial footprint of the Seismic Vessel when transiting; however, the Seismic Vessel may on occasion be required to exit the OA without retrieving the towed equipment, such as during periods of inclement weather. Not practicable to implement.	No
The acoustic source will only be deployed and retrieved within the bounds of the OA.	P = Yes E = Effective	As outlined above, there may be occasions during the Otway Basin 3D MC MSS whereby the vessel may be required to exit the OA while towed equipment remains deployed. In order to ensure there is no accidental discharge of the acoustic source outside of the boundaries of the OA, the acoustic source will only be deployed and retrieved in the OA.	Yes
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	P = Yes E =Effective	A communications protocol will be in place which details the methods used to contact third-party vessels prior to commencement of the Seismic Survey, throughout the survey duration, and following completion of the survey, and those identified only once at sea, to actively manage concurrent activities. Communication with relevant persons allows those potentially affected by the Otway Basin 3D MC MSS to plan activities in a manner that reduces the risk of interactions with the survey vessels and towed equipment (e.g. commercial fishers can avoid deploying gear in the path of the Seismic Vessel). TGS will provide a daily 'look-ahead' plan, which details the proposed operations for the next 48-hour period. Information regarding proposed operations will include, as a minimum, the current positions of the survey vessels and the proposed timing and location of operations for the following 48-hour period. These will be provided daily to those relevant persons who register for the service. As part of this communication, TGS will request information from commercial fisheries on upcoming fishing activities for the next 24 – 48 hours. This will allow the Seismic Vessel to consider alternative lines, where practicable. The Seismic Vessel will change sail lines to accommodate commercial fishers' requests if it is feasible to do so, providing there is open and advanced communication from the commercial fishing operator of their intention to fish at a specified location, no other environmental performance commitments in this EP conflict with a change in sail lines, and providing TGS is afforded a reasonable opportunity to complete the Otway Basin 3D MC MSS in a timely and efficient manner. This control measures have been proposed in response to consultation with relevant persons. Good industry practice, safety benefit outweighs additional cost.	Yes
Publication of a Notice to Mariners confirming the Otway Basin 3D MC MSS will proceed, no less than four weeks before operations commence.	P = Yes E = Effective	Under the Navigation Act 2012, AHO can publish and distribute a Notice to Mariners. This Notice outlines potential hazards and restrictions to other marine users. The notice will be published no less than four weeks before operations commence.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		Good industry practice, safety benefit outweighs additional cost.	
Where the potential for concurrent MSSs to occur is identified, TGS will engage with proponents prior to commencing the Otway Basin 3D MC MSS and develop a SIMOPS plan. SIMOPS planning will include the implementation of a 40 km spatial separation between the Seismic Vessel and any other operating Seismic Vessel in the Otway Basin area.	P = Yes E = Effective	Multiple MSSs operating simultaneously in close proximity to each other would potentially increase the spatial extent of acoustic energy and the intensity of acoustic energy (if acoustic areas overlap). Spatially separating concurrent MSSs reduces the potential for cumulative noise impacts, through limiting sound source levels to those associated with a single acoustic source. Engagement with proponents prior and development of a SIMOPS plan will include the following: • Communications protocol • Work programming • Hazard management • Emergency Response Good industry practice, environmental benefit outweighs additional cost.	Yes
Compensation to fishers and vessel crews (i.e., the claimant) is demonstrated to have occurred for the following circumstances: • Interaction resulting in loss or damage to fishing equipment; • A temporary loss of fish landed catch due to damaged or lost fishing equipment; • Where displacement from fishing grounds results in additional costs incurred due to relocating; or • A temporary reduction in fish landed catch due to the effects of acoustic emissions or displacement from fishing grounds. Claims received from fishers in any circumstances other than those outlined above will not be assessed. Claims will be considered provided the interaction/displacement/loss of catch took place in the Adjustment Area (plus any additional area of avoidance requested around the survey vessels and towed equipment) where the Otway Basin 3D MC MSS took place, and within the project active time frame only.	P = Yes E = Effective	Where impacts of the Otway Basin 3D MC MSS to the commercial fishing industry in Australian waters cannot be avoided or minimised, and commercial fishers experience an economic loss as a result of the Otway Basin 3D MC MSS, financial compensation will be considered as a potential appropriate response to eligible fishery licence holders. Compensation to commercial fishers for loss or damage to fishing equipment, a temporary loss of fish landed catch due to damaged or lost fishing equipment, where displacement from fishing grounds results in additional costs incurred due to relocating, or a temporary reduction in fish landed catch due to effects of acoustic emissions of displacement from fishing grounds that is proven to have occurred as a result of the Otway Basin 3D MC MSS will be considered on a case-by-case basis. Claims received from fishers in any circumstance other than these will not be assessed. Displacement from fishing grounds can be as a result of seismic operational activities and/or as a result of avoiding contaminated waters following a fuel oil spill. For TGS to accept a payment claim, fishers will need to provide suitable documented evidence and data to demonstrate their unavoidable economic loss in accordance with the Commercial Fisheries Compensation Protocol for the Otway Basin 3D MC MSS (**Section 7.2.3.1**). All fishing history and unavoidable economic losses should relate to the Adjustment Area and to the period of Otway MSS operations. The Adjustment Area is defined as an area extending 10 km around the perimeter of the OA. Any consideration of claims (for claims for temporary reduction in catch due to displacement from fishing grounds) beyond the Adjustment Area and outside the operations period will be determined with reference to available and relevant peer reviewed information on the effects of seismic surveys, as well as the impact assessment outlined in the EP as accepted by NOPSEMA. To be eligible for compensation, claimants are required to provide initial notification of their intent to submit a claim to TGS within 30 days of equipment being damaged or lost, and/or being displaced from 'usual fishing grounds' (defined as an area where fishing activity has been recorded by the commercial fishing licence holder on Government statutory fishing returns for at least two of the previous five years). For displacement claims only, licence holders or vessels are to notify TGS at the time of relocation for claims to be valid. A completed Compensation Claim Application Form must be submitted to TGS within 12 months of notifying TGS of the intention to submit a claim. In assessing the merit of the claim, consideration will be given to the circumstances giving rise to the claim, including whether the circumstances could have been reasonably avoided. Subject to a claim being lodged, TGS (at their expense) in consultation with the claimant, will engage a suitably experienced/qualified independent person/organisation as the assessor of the claim, defined as a person or organisation with proven demonstrated experience in data analysis and data auditing processes and procedures within the industry. The assessor will provide TGS with an assessment report, which, upon receiving and considering this report, TGS will provide to the claimant and offer to meet to discuss and address the claim. If a claimant disagrees with the claim assessment outcome and cannot reach agreement with TGS, they may, within 30 days, opt to request a suitably experienced and qualified independent third-party to review and determine the outcome of the claim. This appointment will be mutually agreed between TGS and the claimant. The dispute will be resolved within 60 days of dispute receipt by TGS, with the costs of engaging the independent third-part covered by TGS.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		Good industry practice, socio-economic benefits outweigh additional cost.	
Notification to recreational and commercial divers that are undertaking diving activities within 45 km of the acoustic source.	P = Yes E = Effective	Guidance note DMAC 12 issued by the DMAC "*Safe Diving Distance from Seismic Surveying Operations* recommends that where diving and seismic activity occur within 30 km of each other, a joint risk assessment should be conducted. Where diving and seismic activities occur within 45 km of each other, all parties should be made aware of the planned activity. Good industry practice, safety benefit outweighs additional cost.	Yes
A joint risk assessment will be conducted with recreational and commercial divers where their respective diving activities may occur within 30 km of the acoustic source.	P = Yes E = Effective	Guidance note DMAC 12 issued by the DMAC "*Safe Diving Distance from Seismic Surveying Operations* recommends that where diving and seismic activities occur within 30 km of each other, a joint risk assessment should be undertaken. Good industry practice, safety benefit outweighs additional cost.	Yes
Alternatives/Substitutes Considered			
Elimination of noise emissions from the acoustic source.	P = No E = Very Effective	Noise emissions are a fundamental requirement of any MSS in order to produce the detailed geological images and meet survey objectives. As a result, noise emissions cannot be eliminated.	No
Use of alternative seismic sound sources and alternative geological imaging technology.	P = No E = Unknown Effectiveness	Alternative technologies such as 'eSource' and 'e-seismic' have been considered. These technologies are relatively new technologies that have been designed to limit the component of sound levels at frequencies higher than then frequencies essential for seismic exploration. Presently, however, there is only one vessel globally with the eSource capability and is it currently impossible to commit to a single seismic operator at this stage. To replace or update the seismic array on another vessel would cost in the order of US$2 million for the new hardware. Marine vibroseis is another emerging technology that may reduce sound output. This technology has been designed to release the same amount of energy as a standard airgun array, but rather than releasing high-magnitude impulses, energy is release continuously or intermittently for al longer period of time. Instantaneous physiological effects (e.g. injury) ranges, such as those typically represented by the single impulse metrics may be reduced, however, cumulative sound exposures (which result in the greatest effects ranges for marine mammals and most other environmental receptors) are unlikely to be reduced, and the continuous nature of vibroseis introduces new issues in relation to behavioural and masking effects. This technology is also not widely or commercially available. The identified alternative technologies may have limited or no additional environmental benefit and could attract a commercial and financial cost that is not justified.	No
Additional Controls Considered			
The Seismic Vessel will not return to acquire any un-surveyed portion of any sail line (i.e. infill acquisition or re-shooting) until at least 24-hours has passed.	P = No E = Effective	As infill acquisition has the potential to expose site attached benthic species (including fish species targeted by commercial fisheries), to a second dose of seismic energy within a relatively short period of time, TGS considered deferring any infill acquisition by 24 hours to reduce the cumulative seismic exposure risk to site-attached species. However, for the following reasons this potential control measure will not be implemented during the Otway Basin 3D MC MSS: • Infill acquisition is typically displaced by 500 – 1,000 m from the original line and rescheduled for a later date to promote survey efficiency; and • Injury effects for site attached marine fauna are spatially restricted (c. 500 m for crustaceans and not predicted at any distance for bivalves, sponges and corals) (see UAM results in Appendix B); • While TTS effects on fish are theoretically possible out to 4.8 km, such effects are contingent on sustained exposure over a 24-hour period which is operationally untenable on account of continuous movement of the Seismic Vessel even if both the original line and the infill were acquired within a 24-hour period. While re-shooting aims to replicate the original sail line, the reason for the re-shoot is usually that acquisition was shut down on the initial pass; hence cumulative exposure will not result from re-shooting.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
A 100 m precautionary Shut-down Zone from the operating source will be applied to marine turtles. The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting.	P = Yes E = Effective	The Otway region does not support biologically significant populations or habitat for marine turtles, however, individuals (particularly leatherback turtles) may be present in the region. While the potential for turtles to occur in close proximity to the acoustic source during the Otway Basin 3D MC MSS is limited, in order to reduce the potential risks to marine turtles, a 100 m Shut-down Zone is considered to be a practicable measure to implement. A 100 m Shut-down Zone is considered to be conservative given that PTS and TTS effects are not predicted to be exceeded within the limited of the modelling resolution (i.e. 20 m). Based on SEL_{24hr} results, PTS may occur within 110 m and TTS may occur from accumulated exposures within 310 m of the acoustic source. The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting. Over the course of 15 minutes, the Seismic Vessel will travel approximately 2 km from the sighting location. Given that marine turtles are slow swimming relative to the Seismic Vessel, and due to their limited sensitivity to sound, the shut-down and start-up delay is considered protect against PTS and TTS effects. The 2 km distance that the vessel would travel from the sighting location is greater than the 1.37 km modelled Rmax for the 175 dB SPL significant behavioural disturbance threshold.	Yes
Policy Statement 2.1: Part B.1 – Marine Mammal Observers. The use of suitably trained, dedicated and experienced MFOs to undertake visual observations for whales and ensure that the appropriate mitigation measures outlined in this EP are implemented. MFOs onboard survey vessels to maintain vigilance for SBT while conducting watches for other marine fauna.	P = Yes E = Effective	The use of trained, dedicated and experienced MFOs s is a recommendation of Part B.1 of Policy Statement 2.1 when the likelihood of encountering whales is moderate to high. From the assessment undertaken within this EP (**Section 4.5.6**) it has been determined that the likelihood of encountering whales during the Otway Basin 3D MC MSS is high. Therefore, TGS will have two dedicated, trained and experienced MFOs onboard the Seismic Vessel for the duration of the Otway Basin 3D MC MSS and two dedicated, trained and experienced MFOs will be stationed on the Attending Support Vessel for the duration of the Otway Basin 3D MC MSS. The role of MFOs is to undertake all visual observations for marine fauna and to ensure that the appropriate mitigation measures, as outlined in this EP, occur in response to any marine fauna sightings. The use of two MFOs onboard the Seismic Vessel and two onboard the Attending Support Vessel provides some redundancy in the event one MFO is unavailable and facilitates the implementation of Extended Observation Zones for BW/PBW and SRW (see the specific controls that will be implemented for these species later in this table or **Appendix M**). At least one MFO on the Seismic Vessel and the Attending Support Vessel will perform marine mammal observations during daylight hours. All MFOs used during the Otway Basin 3D MC MSS must have proven 'at sea' experience in whale identification and behaviour, and distance estimation, and must be confident in the identification of those species that the EP predicts will be present in the OA. All MFOs will hold a JNCC Marine Mammal Observation certification (or equivalent). In addition, the lead MFO on the Seismic Vessel must have logged a minimum of 20 weeks' relevant sea-time engaged in marine seismic survey operations in Australian waters as an MFO. Following consultation with ASBTIA, TGS propose to have MFOs conducting visual observations for marine fauna to also record any observations of SBT aggregations and share sightings data with stakeholders. Sightings will be reported to ASBTIA within 24-hours of the observation being made. Environmental benefit gained outweighs the additional cost.	Yes
EPBC Act Policy Statement 2.1: Part B.2 – Night-time/Poor Visibility.	P = Yes E = Effective	Policy Statement 2.1 recommends that in areas where whales are expected to be encountered, the proponent should include measures to detect whale presence and apply measures to reduce the likelihood of encounters. Regarding this, a combination of PAM and adaptive management measures will be implemented to provide an effective spread of controls and, ultimately, level of protection to whales in the OA under night-time/poor visibility conditions. PAM requirements are outlined presently in this table. The adaptive management measures that relate to night time/poor visibility operations are: • Low Visibility or Night-time Operations may occur provided that there have not been three or more whale instigated shut-down situations during the preceding 24-hour period.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		• Low Visibility or Night-time Operations may occur provided that no BW/PBW shut downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); however Low Visibility and Night Time Operations inside the BW BIAs/buffer are contingent on aerial surveys occurring within 7 days prior to acquisition occurring here. • Low Visibility or Night-time Operations may occur provided the no SRW shut downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); however Low Visibility and Night Time Operations inside the SRW Ag BIA/buffer are contingent on aerial surveys occurring within 7 days prior to acquisition occurring here. • Soft starts may only commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer providing acquisition has occurred within the preceding 24 hours and no whale initiated shut downs have been made during this period. Note that a combination of control and adaptive management measures are proposed to reduce reliance on PAM, which is not considered to be a particularly reliable method for detecting low-frequency cetaceans. Environmental benefit gained outweighs the additional cost.	
A PAM System will run 24-hours per day on the Seismic Vessel during the Otway Basin 3D MC MSS, with dedicated, trained, and experienced PAM Operators conducting acoustic monitoring for the presence of cetaceans while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedures. At least two dedicated, trained, and experienced PAM Operators will be on the Seismic Vessel for the duration of the Otway Basin 3D MC MSS, with at least one PAM Operator maintaining acoustic watch at all times while the acoustic source is active and during the 30 minutes prior to the commencement of any Soft Start Procedure.	P = Yes E = Effective	Visual methods of scanning for whales are restricted to daylight hours and relatively calm weather conditions. Animal behaviour such as diving further reduces detection probability (Verfuss *et al*., 2018). PAM detects whale vocalisations in real-time and is useful during night-time, low visibility operations and for submerged animals. The use of PAM is a suggestion under Part B.5 (Additional Measures) of Policy Statement 2.1 when the likelihood of encountering whales is moderate to high. TGS will run and monitor a PAM system around the clock while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedures; hence, detections of cetacean vocalisations will occur both at night and during daylight hours (to augment visual detections). The PAM system will be programmed to cover the frequency range 10 Hz to 200 kHz to theoretically detect a) low frequency vocalisations of baleen whales, and b) the high frequency echolocation clicks of sperm whales. Two trained, dedicated and experienced PAM Operators will be on the Seismic Vessel for the duration of the Otway Basin 3D MC MSS, with at least one PAM Operator maintaining 'acoustic watch' at all times. The lead PAM Operator must have logged a minimum of 20 weeks' relevant sea-time engaged in seismic survey operations in Australian waters as a PAM Operator (following the recommendation of the Marine Mammal Observer Association (MMOA, 2019). All PAM Operators will need to be able to demonstrate competency in the acoustic identification of the species that are likely to be present during the Otway Basin 3D MC MSS, and in interpreting acoustic software and estimating distance to any detected whale calls. PAM experience will be a pre-requisite for the recruitment of personnel for these positions. A full replacement PAM system will be kept onboard the Seismic Vessel and will be used as a back-up in the event that the PAM system malfunctions and is unable to be repaired. In the event that the PAM system malfunctions or becomes damaged, seismic operations may continue for 20 minutes without PAM while the PAM Operator diagnoses the issue. If it is found that the PAM system needs to be repaired or replaced, seismic operations may continue for an additional two hours without operational PAM as long as: a) it is daylight hours and the sea state is less than or equal to Beaufort 4, b) no whales were detected solely by PAM in the relevant mitigation zones in the previous two hours; c) two MFOs maintain watch at all times during seismic operations when PAM is not operational, d) seismic operations with an active source, but without an active PAM system, do not exceed a cumulative total of four hours in any 24-hour period. Frequency sensitivity will be designed into the hardware to remove vessel noise at very low frequencies masking whale vocalisations which may limit the performance of PAM.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		PAMGuard software will be incorporated into the PAM system to assist with locating and classifying the vocalisations of marine mammals. This sophisticated software allows the trained PAM Operators to make robust decisions during real-time mitigation operations, such as requesting shutdowns based on whales entering the Precaution Zones. The full PAM specs that will be implemented for the Otway Basin 3D MC MSS are provided in **Appendix L**. Environmental benefit gained outweighs the additional cost.	
Use of PAM on support vessel/s.	P = No E = Effective	PAM provides a useful detection method in addition to visual observations by MFOs and will be implemented onboard the Seismic Vessel. However, due to the limited capacity for additional personnel onboard the support vessel/s, the limitations of PAM systems to detect baleen whales, and the significant costs associated with engaging suitable PAM Operators and equipment, the cost of this option is considered to outweigh the limited potential for any further risk reduction that will not already be provided by the PAM system onboard the Seismic Vessel.	No
Policy Statement 2.1: B.3 – Use of spotter aircraft and vessels to detect presence of cetaceans. Observers conducting periodic aerial surveys will also record any sightings of SBT aggregations.	P = Yes E = Effective	Part B of Policy Statement 2.1 suggest spotter vessels and aircraft may be employed to determine the presence and likelihood of encountering whales where the likelihood of encountering whales is high. Given the proximity of the Otway Basin 3D MC MSS to the BW foraging BIAs and the SRW Ag BIA, it Is predicted that whale densities will be higher in the inshore sections of the OA where they approach or overlap these BIAs. The following apply to aerial surveys for the Otway Basin 3D MC MSS: • All reasonable efforts will be made to ensure that aerial surveys will be conducted to assist with the detection of BW/PBW in the BW BIAs/buffer during the 'foraging shoulder season'. Within the seven days prior to commencement of any acquisition in the BW BIAs/buffer aerial surveys will be flown, if possible, to identify any BW/PBWs that may be present. Any such detections will result in acquisition within the BW BIAs/buffers being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of BW/PBWs in the BW BIAs/buffer by relocating to parts of the BW BIAs/buffer where potential impacts on BW/PBWs are less likely. If this requirement for aerial surveys cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met. Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW and to redirect seismic survey efforts in order to avoid BW/PBW that are present. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of BW/PBW from the air. • All reasonable efforts will be made to ensure aerial surveys will be conducted to assist with the detection of SRWs in the SRW Ag BIA/buffer during April and October. Within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer, aerial surveys will be flown, if possible, to identify any SRW that may be present. Any such detections will result in acquisition within the SRW Ag BIA/buffer being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of SRWs in the SRW Ag BIA/buffer by relocating to parts of the OA where potential impacts on SRWs are less likely. If this requirement for aerial surveys cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met. Aerial survey efforts will concentrate on the area of the SRW Ag BIA/buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Aerial surveys should also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs and to redirect seismic survey efforts in order to avoid areas where SRWs are present. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW from the air.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		• Aerial surveys will also be used to support whale detection efforts prior to 2D tie line acquisition. 2D tie line acquisition inside any BIA/buffer can occur at any time providing an aerial survey has been conducted within 4 days of such operations commencing and no baleen whales have been detected. This aerial survey must focus on the area of planned acquisition that overlaps the BIA/buffer and must extend to at least 42 km on either side of the planned 2D sail line. Following consultation with ASBTIA, TGS proposed to have MFOs conducting visual observations for marine fauna to also record any observations of SBT aggregations and share sightings data with relevant persons. MFOs onboard the survey vessels and conducting periodic aerial surveys for the Otway Basin 3D MC MSS will also conduct observations for aggregations of SBT, with any sightings reported to ASBTIA within 24-hours of the observation being made. Environmental benefit gained outweighs the additional cost.	
Policy Statement 2.1: B.4 – Increased Precaution Zones. The Shut-down Zone will be extended to 7 km from the acoustic source for BW/PBW and SRW and 2 km from the acoustic source for all 'other whales'. In addition, if a SRW mother-calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut down. When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.	P = Yes E = Effective	Policy Statement 2.1 defines the standard Shut-down Zone as being 500 m from the acoustic source with a Low-power Zone out to 2 km. In keeping with their precautionary approach, TGS have committed to extending the Shut-down Zone out to 7 km from the acoustic source for BW/PBW and SRW and 2 km from the acoustic source for all 'other whales'. Detection of a SRW mother-calf pair from the Seismic Vessel or the Attending Support Vessel at any distance will trigger an immediate shut down. When species identification is uncertain, a precautionary approach will be taken, and the additional management procedures for BW/PBW or SRW will be followed until identification is otherwise confirmed. Environmental benefit gained outweighs the additional cost.	Yes
Policy Statement 2.1: B.6 Adaptive Management Measures: all whales. If there have been three or more whale instigated shut-down situations during the preceding 24-hour period, then low visibility or night-time operations must not occur.	P = Yes E = Effective	If there have been three or more whale instigated shut-down situations during the preceding 24-hour period, then low visibility or night-time operations must not occur. In addition to this adaptive management controls specific to BW/PBW and SRWs are presented in this table below. Decisions on the implementation of these controls will be made daily, i.e. at dusk each day, the MFO on-duty will advise whether these thresholds have been triggered and will confirm if night-time operations can occur. The same applies for low visibility operations where decisions on whether to continue operating will be made each time low visibility conditions arise. Environmental benefit gained outweighs the additional cost.	Yes
Policy Statement 2.1: B.6 Adaptive Management Measures: blue whales/pygmy blue whales Adaptive management controls will be implemented for BW/PBW if higher than anticipated numbers of BW/PBWs are observed (three or more BW/PBW instigated shut downs are made during the preceding 48 hour period).	P = Yes E = Effective	In accordance with Policy Statement 2.1, adaptive management procedures will be adopted for BW/PBW as follows: • If higher than anticipated numbers of BW/PBW are observed (three or more BW/PBW instigated shut-downs are made during the preceding 48 hour period) at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply: a. Acquisition in the BW BIAs/buffer must cease; b. Low Visibility or Night-time Operations must cease; and c. Normal operations may only resume after 24 hours of no BW/PBW instigated shut-downs. When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed. Environmental benefit gained outweighs the additional costs.	Yes
Policy Statement 2.1: B.6 Adaptive Management Measures: southern right whales Adaptive management controls will be implemented for SRW in the following circumstances: • If higher than anticipated numbers of SRWs are observed (three or more SRW instigated shut-downs are made during the preceding 48 hour period); or • If a SRW mother-calf pair is observed from the Seismic Vessel or the Attending Support Vessel.	P = Yes E = Effective	In accordance with Policy Statement 2.1, adaptive management procedures will be adopted for SRW as follows: • If higher than anticipated numbers of SRW are observed (three or more SRW instigated shut-downs are made during the preceding 48 hour period) at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply: a. Acquisition in the SRW Ag BIA/buffer must cease b. Low Visibility or Night-time Operations must cease;	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		c. The acoustic source will be shut-down and the Seismic Vessel will relocate to another area at least 42 km away from the last SRW sighting, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone; and d. Normal operations may only resume after 24 hours of no SRW instigated shut-downs. • If a SRW mother-calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone. When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed. Environmental benefit gained outweighs the additional cost.	
Policy Statement 2.1: B.6 Adaptive Management Measures: other whales Adaptive management controls will be implemented for other whales in the following circumstances: • If higher than anticipated numbers of other whales are observed (three or more instigated shut-downs are made during the preceding 24-hour period); or • If an 'other whale' mother-calf pair is observed within 12 km of the active acoustic source.	P = Yes E = Effective	In accordance with Policy Statement 2.1, adaptive management procedures will be adopted for 'other whales' as described below. • If three or more 'other whale' instigated shut-downs occur within a 24-hour period, the Seismic Vessel will relocate at least 12 km in the direction away from the sightings before commencing Pre Start-up Visual Observations and Soft Start Procedures; and • If an 'other whale' mother-calf pair is observed within 12 km of the active acoustic source during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 12 km away from the last recorded position of the mother-calf pair before commencing Pre Start-up Visual Observations and Soft Start Procedures. When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed. Environmental benefit gained outweighs the additional cost.	Yes
Additional Management Measures – Blue Whales/Pygmy Blue Whales to allow Biologically Important Behaviours to Continue: • No operation of the acoustic source within 16 km of any BW/PBW BIA during the period January to June (inclusive) which represents the peak foraging season during which BW/PBW are expected to consistently be present at foraging areas in and around the OA at elevated densities. The only exception allowed relates to the acquisition of the 2D tie line. • Implementation of an Extended 7 km Shut-down Zone[AC]; • Additional MFO observation effort (including aerial surveys); and • Implementation of adaptive management measures.	P = Yes E= Effective	In addition to the above-mentioned Standard and Adaptive Management Control Measures, the following control measures are proposed to afford a high level of protection to endangered BW/PBW during the Otway Basin 3D MC MSS. In particular, the BW Conservation Management Plan includes the following action: "*Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area*". In addition, one of the CMPs interim objectives is that "*anthropogenic threats are demonstrably minimised*" and in particular "*Robust and adaptive management regimes leading to a reduction in anthropogenic threats to Australian blue whale are in place*". The proposed additional management procedures for BW/PBW have been developed to ensure consistency with these requirements. Cumulative TTS effects from acquisition on the continental slope are predicted to occur to 15.4 km inshore of the active acoustic source and out to 32 km offshore of the acoustic source; and the maximum predicted onset distance for behavioural impacts for PBW is 7 km (see **Section 7.2.2.2.7** and **Section 7.2.2.3.6**). To mitigate the effects of the Otway Basin 3D MC MSS on biologically important behaviours, the following additional management procedures are proposed to be implemented for BW/PBW during the Otway Basin 3D MC MSS (following **Appendix M**): • BMP 1: A 16 km buffer will be established around all BW BIAs where they overlap or approach the OA.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		• BMP 2: The Seismic Vessel will not activate the acoustic source(s) within any BW BIAs/buffer from January to June (inclusive) which represents the peak foraging season during which BW/PBW are expected to consistently be present at foraging areas in and around the OA at elevated densities. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2** in **Appendix M**. • BMP 3: A 7 km Extended Shut-down Zone will be implemented for BW/PBW throughout the OA (including the BW BIAs/buffer). On this basis a Low Power Zone is deemed unnecessary. • BMP 4: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for BW/PBWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5 – 7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5 – 7 km ahead of the seismic vessel to assist with BW/PBW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met: a. The MFO onboard the EOZ Support Vessel continues observations for BW/PBWs; b. There have been no BW/PBW instigated shut-downs in the preceding 6 hours; and c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel. • BMP 5: Low Visibility or Night-time Operations may occur provided that no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility). • BMP 6: During the 'foraging shoulder season' months of September to December and July the seismic vessel is permitted to operate in the BW BIAs/buffer in accordance with the following protocols: a. All reasonable efforts[36] will be made to ensure that aerial surveys will be conducted to assist with the detection of BW/PBW in the BW BIAs/buffer during the 'foraging shoulder season'. Within the seven days prior to commencement of any acquisition in the BW BIAs/buffer aerial surveys will be flown, if possible, to identify any BW/PBWs that may be present. Any such detections will result in acquisition within the BW BIAs/buffers being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of BW/PBWs in the BW BIAs/buffer by relocating to parts of the BW BIAs/buffer where potential impacts on BW/PBWs are less likely. b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met. c. Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW and to redirect seismic survey efforts in order to avoid BW/PBW that are present.	

[36] Noting that in some circumstances aerial surveys may not be possible due to weather or aircraft availability constraints.

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of BW/PBW from the air. e. Start-up (via soft start) can only commence in the BW BIAs/buffer during the 'foraging shoulder season' if the following criteria are met: v. A minimum of two hours of daylight remain before nightfall; vi. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone; vii. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no BW/PBW have been sighted; and viii. The start-up location does not occur within 32 km of an area where a BW/PBW detection has been made in the last four days. • BMP 7: If a BW/PBW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 32 km away from the last PBW sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible[37], then acquisition will cease and will not recommence until 24-hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone. • BMP 8: A Start-up Delay will occur if a BW/PBW enters or is detected in the 7 km Extended Shut-down Zone during the soft start, and soft start procedures may only resume once the BW/PBW is observed to move outside this Shut-down Zone or when 30 minutes have lapsed since the last BW/PBW sighting. • BMP 9: If higher than anticipated numbers of BW/PBW are observed (three or more BW/PBW instigated shut downs are made during the preceding 48 hour period[38]) at any time or location during the survey, the following adaptive management controls will apply: a. Acquisition in the BW BIAs/buffer must cease; b. Low Visibility or Night-time Operations must cease; and c. Normal operations may only resume after 24 hours of no BW/PBW instigated shut downs. In light of the conservative approach taken by the modelling, the proposed controls (as outlined below) demonstrate consistency with the objective of the BW Conservation Management Plan (that "anthropogenic threats are demonstrably minimised") and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered). On this basis, acoustic injury to BW/PBW can be avoided managed to an acceptable level throughout the OA; hence, anthropogenic threats (as they relate to physiological impacts from underwater noise) are minimised through robust and adaptive management measures. Environmental benefit gained outweighs the additional cost.	
Additional Management Measures – Southern Right Whales to allow Biologically Important Behaviours to Continue: • No operation of the acoustic source within 42 km of the SRW Ag BIA during the core aggregation months of May to September; • Implementation of an Extended 7 km Shut-down Zone[AC]; • Additional MFO observation effort (including aerial surveys); and • Implementation of adaptive management measures.	P = Yes E= Effective	In addition to the above-mentioned Standard and Adaptive Management Control Measures, the following control measures are proposed to afford a high level of protection to endangered SRWs during the Otway Basin 3D MC MSS. The operative SRW Conservation Management Plan (CoA, 2012) states that "*Noise interference is of particular concern within or close to southern right whale aggregation areas where young calves are present and whales are resident for long periods of time*"; hence the measures described below are targeted to address these specific noise impacts. While there is another designated 'known core range' BIA in the area, the OA only marginally overlaps with this, and the expectation is that animals traverse this area on their way to and from the more coastal aggregation	Yes

[37] For instance, towards the end of the survey when few survey lines remain to be acquired.
[38] Note that any unidentified whale/s will contribute to this count.

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		areas and connecting habitat. Strong adaptive management measures have been developed to address potential noise effects in the wider area. The 42 km onset distance for behavioural impacts to mother-calf pairs has been used to define a buffer zone around the SRW Aggregation BIA (referred to as the SRW Ag BIA herein). No acquisition will occur within the SRW Ag BIA or the 42 km buffer during the core aggregation months of May to September (SWIFFT, 2023). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2** in **Appendix M**) and will only take approximately 12 hours to acquire. This spatio-temporal measure has been designed to eliminate any physiological or behavioural effects on SRWs in the SRW Ag BIA during the months over which SRWs are expected to be present. On this basis, compliance with Interim Recovery Objective 5 of the operative Southern Right Whale Conservation Management Plan that anthropogenic threats are demonstrably minimised, is achieved. This control also aligns with the recommendation in Policy Statement 2.1 that seismic surveys should be undertaken outside of biologically important areas at biologically important times. While the Draft National Recovery Plan for the Southern Right Whale (CoA, 2022) is not yet operative, once finalised it will supersede the current operative plan. The conservation actions included in the draft plan that are of relevance to seismic survey noise are listed in **Table 79** along with how they are addressed by the proposed controls. TGS is aware that the designated BIAs are also being reviewed as part of the process underpinning the review of the recovery plan. There is a strong possibility that the BIA boundaries for SRWs will change prior to the commencement of the proposed Otway Basin 3D MC MSS. TGS can confirm that the 42 km buffer as described above will be applied to the updated aggregation/reproductive BIA should it be published before the Otway Basin 3D MC MSS commences. To mitigate the effects of the Otway Basin 3D MC MSS on biologically important behaviours, the following additional management procedures are proposed to be implemented for SRWs during the Otway Basin 3D MC MSS (following **Appendix M):** • <u>SRMP 1:</u> A 42 km buffer will be established around the SRW Ag BIA where it approaches the OA. • <u>SRMP 2:</u> The Seismic Vessel will not activate the acoustic source(s) within the SRW Ag BIA/buffer from May to September (inclusive) which represents the core aggregation months during which SRWs are expected to be present here. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2** in **Appendix M**. • <u>SRMP 3</u>: A 7 km Extended Shut-down Zone will be implemented for SRWs throughout the OA (including the SRW Ag BIA/buffer). On this basis a Low Power Zone is deemed unnecessary. • <u>SRMP 4</u>: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for SRWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5 – 7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5 – 7 km ahead of the seismic vessel to assist with SRW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met: a. The MFO onboard the EOZ Support Vessel continues observations for SRWs; b. There have been no SRW instigated shut-downs in the preceding 6 hours; and c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel.	

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		• <u>SRMP 5:</u> Low Visibility or Night-time Operations may occur provided that no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility). • <u>SRMP 6:</u> During April and October (shoulder aggregation months) the Seismic Vessel is permitted to operate in the SRW Ag BIA/buffer in accordance with the following protocols: a. All reasonable efforts will be made to ensure aerial surveys will be conducted to assist with the detection of SRWs in the SRW Ag BIA/buffer during April and October. Within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer, aerial surveys will be flown, if possible, to identify any SRW that may be present. Any such detections will result in acquisition within the SRW Ag BIA/buffer being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of SRWs in the SRW Ag BIA/buffer by relocating to parts of the OA where potential impacts on SRWs are less likely. b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met. c. Aerial survey efforts will concentrate on the area of the SRW Ag BIA/buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Aerial surveys should also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs and to redirect seismic survey efforts in order to avoid areas where SRWs are present. d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW from the air. e. Start-up (via soft start) can only commence in the SRW Ag BIA/buffer during April and October if the following criteria are met: vi. A minimum of two hours of daylight remain before nightfall; vii. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone; viii. A Support Vessel is available to undertake the requisite marine mammal monitoring; ix. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no SRWs have been sighted; and x. The start-up location does not occur within 42 km of an area where a SRW detection has been made in the last four days. • <u>SRMP 7:</u> If a SRW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 11 km away from the last SRW (unaccompanied) sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. Note that this distance increases if a calf is present in accordance with **SRMP 10**. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone. • <u>SRMP 8</u>: A Start-up Delay will occur if a SRW enters or is detected in the 7 km Extended Shut-down Zone during soft start, and soft start procedures may only resume once the SRW is observed to move outside this Shut-down Zone or 30 minutes have lapsed since the last SRW sighting.	

<table>
<tr><th>Control Measure</th><th>Practicability/ Effectiveness</th><th>Justification</th><th>Will it be adopted?</th></tr>
<tr><td></td><td></td><td>SRMP 9: If higher than anticipated numbers of SRW are observed (three or more SRW instigated shut downs are made during the preceding 48 hour period[39]) at any time or location during the survey, the following adaptive management controls will apply:
a. Acquisition in the SRW Ag BIA/buffer must cease
b. Low Visibility or Night-time Operations must cease;
c. The acoustic source will be shut down and the Seismic Vessel will relocate to another area at least 42 km away from the last SRW sighting, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone; and
d. Normal operations may only resume after 24 hours of no SRW instigated shut downs.
SRMP 10: If a SRW mother and calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.
In light of the conservative approach taken by the modelling, the proposed controls (as outlined below) demonstrate consistency with the objectives of both the operative SRW Conservation Management Plan (that anthropogenic threats are demonstrably minimised) and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered).
In addition to the measures outlined above, TGS has contacted the Department of Energy, Environment, and Climate Action (DEECA) to enquire about the possibility of establishing a data sharing agreement whereby TGS receive notifications of SRW sightings (date and location) in a timely fashion throughout the SRW breeding season (via WhaleFace or other platforms that feed into the DEECA Southern Right Whale Sightings Database). DEECA has agreed to provide periodic in-season updates of sightings to TGS throughout the duration of the Otway Basin 3D MSS. DEECA has also agreed to provide sightings summaries from the monthly aerial surveys that they undertake throughout each breeding season. This data sharing arrangement will enable operational activity to be redirected away from areas in which whales are known to be present; hence will assist with reducing any potential impacts on this endangered species.
Environmental benefit gained outweighs the additional cost.</td><td></td></tr>
<tr><td>Additional Management Measures – other whales:
A 2 km Extended Shutdown Zone[AC] for ‘other whales’ will be implemented throughout the entire OA at all times. On this basis a low power zone is deemed unnecessary.
Soft starts at night and during periods of low visibility will also be limited[AC] as will acquisition of the 2D tie line within any BIA/buffer[AC].</td><td>P = Yes
E= Effective</td><td>In addition to the above-mentioned Standard and Adaptive Management Control Measures, the following control measures are proposed to afford a high level of protection to all other whales during the Otway Basin 3D MC MSS in accordance with the intention of the Australian Whale Sanctuary:
Soft start procedures throughout the OA can only proceed under the following circumstances:
a. If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone[AC];
b. If acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.
2D tie line acquisition inside any BIA/buffer will only be permitted to occur in daylight hours, and two MFOs must be on duty on the Seismic Vessel and two MFOs must be on-duty on the Attending Support Vessel. 2D tie line acquisition inside any BIA/buffer can occur at any time providing the following criteria are met:</td><td>Yes</td></tr>
</table>

[39] Note that any unidentified whale/s will contribute to this count.

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		a. An aerial survey has been conducted within 4 days of such operations commencing and no baleen whales have been detected. This aerial survey must focus on the area of planned acquisition that overlaps the BIA/buffer and must extend to at least 42 km on either side of the planned 2D sail line; b. 2D tie line acquisition inside any BIA/buffer must not occur for more than 12 hours total within any 24 hour period; c. The Extended Observation Zone as described in BMP 4 is implemented; and d. The acoustic source must not be active for more than a combined total of 20 hours (maximum) in the BIAs/buffers. Environmental benefit gained outweighs the additional cost.	
No acquisition overlapping the West Tasmanian Canyons KEF.	P = No E= Limited Effectiveness	This would result in the removal of 3,769 km² of area from the proposed OA, equating to approximately 8.9% of the OA and TGS would not be able to obtain sufficient data for all hydrocarbon prospects being targeted. The West Tasmania Canyons KEF is considered to be of importance due to the topography and bathymetry within the KEF which support a high biodiversity of benthic invertebrates and facilitate high productivity. Due to the water depths present within the West Tasmania Canyons KEF, there will be no impacts on the benthic invertebrate communities present within the KEF. The adopted criteria of 226 dB re 1 µPa PK, which is the threshold for no effects for sponges and coral, was not detected at any distance from the 3,480 in³ acoustic source (Welch *et al.*, 2023). Control is not practicable to implement and cost outweighs environmental benefit gained.	No
Consider adopting varying Seismic Vessel relocation distances following whale instigated shut-downs to account for propagation variation inshore/offshore/end-fire.	P = No E = Unknown Effectiveness	The results of the modelling confirm that underwater propagation of seismic survey noise varies depending on the direction it travels in relation to both the acoustic source and the local bathymetry (**Appendix B**). Because of this, the contour at which the threshold level for TTS in marine mammals is not symmetrical around the acoustic source. Using BW/PBW as an example, the animat modelling indicates that in the offshore direction the TTS threshold is exceeded out to 32 km, but in the onshore direction the TTS threshold is only exceeded out to c. 16 km, the distance to this threshold would change again in the end-fire direction. TGS notes that some recent seismic surveys in Australian waters have used this directional variation in propagation to set their requirements for seismic vessel relocation following marine mammal instigated shut-downs. While this approach has the potential to reduce the relocation distance in certain directions from the acoustic source, it is also a complex and imprecise control regime to implement. TGS considers that this complexity increases the likelihood of non-compliances and for this reason this approach will not be taken during the Otway Basin 3D MSS. Instead, and in accordance with the precautionary principle, when relocation distances have been defined, they have been informed by the maximum relevant onset distance in each instance.	No
Consider a shut-down requirement for BW/PBW mother-calf pairs at any distance in line with the requirement for SRWs.	P = No E = Very Effective	For cetaceans (as with most animals) mother-calf pairs are generally regarded as the cohort that is most vulnerable to disturbance. For this reason, they are often offered a higher level of protection than other cohorts. Blue whale presence in the OA is not typified by reproductive behaviours (which occur in Indonesian waters, see **Section 4.5.6.1.1**) and the level of protection offered to this species (spatio-temporal restrictions on acquisition within the BW BIAs and the 7 km Extended Shut-down Zone) is high. If a BW/PBW mother-calf pair is detected, the 7 km Shut-down Zone will protect these individuals from behavioural disturbance and the 32 km relocation requirement post shut-down will mean that hearing injury will be avoided. These control measures are considered to provide sufficient protection to BW/PBW mother-calf pairs, noting that a higher level of protection is afforded to SRW mother-calf pairs as the region is recognised as a calving location and very young calves could be present.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Use of an additional vessel for the specific purpose of marine mammal monitoring.	P = No E = Limited Effectiveness	Having another vessel specifically dedicated to marine mammal monitoring (with MFOs and a PAM system onboard) could provide additional capacity for detecting whales at greater distances than from the Seismic Vessel. In this respect a dedicated marine mammal monitoring vessel would provide a high level of support to the extended Precaution Zones outlined in this EP. However, instead of using an additional vessel that is dedicated to marine mammal observations, all Extended Observation Zones will be monitored using at least one Support Vessel as an additional observation platform with two MFOs onboard. Aerial surveys will also be required prior to any acquisition in the BW/PBW BIAs/buffer and the SRW Ag BIA. On this basis, an additional and dedicated marine mammal monitoring vessel is not considered to be necessary as the proposed control measures that will be adopted sufficiently address the risks to marine mammals as quantified by underwater noise modelling. In addition, the adaptive management measures that will be implemented also serve to manage risk to marine mammals throughout the survey. Cost is grossly disproportionate to the environmental benefit gained from implementing the control measure.	No
Activation of a single low power acoustic source (mitigation gun) on line turns.	P = Yes E = Limited Effectiveness	The ongoing activation of a single low power acoustic source during line turns is often considered to reduce the likelihood of cetaceans approaching the Seismic Vessel during turns when the acoustic array is inactive (i.e. data acquisition is not occurring). While the use of a mitigation gun potentially assists by displacing marine fauna away from the acquisition area, the acoustic source will be completely shut down on line turns during the Otway Basin 3D MC MSS as 1) mitigation guns serve to increase the overall noise levels in the marine environment and 2) mitigation guns act in direct contradiction to the objectives of the BW Conservation Management Plan which specifically requires that blue whales are not displaced from foraging areas.	No
Implementation of shut downs for dolphins and pinnipeds.	P = Yes E= Effective	A small shut-down zone (e.g. 100 m) for dolphins is sometimes implemented around the active acoustic source as a precaution to address the purpose of the Australian Whale Sanctuary that cetaceans are not killed, injured, or interfered. TGS considered this approach for dolphins and otariid seals and rejected it on the basis that while dolphin or fur seal/se lion presence in the immediate vicinity of the Seismic Vessel is expected, it will be transitory (typically < 1 hour) and will certainly be less than the 24 hours for which TTS and PTS predictions apply. For dolphins (HF cetaceans) and otariid seals, the onset distance for TTS_{24h} is 100 m, and PTS is not predicted for dolphins or otariid seals (either from cumulative exposure or exposure to a single pulse). Cost (in terms of operational downtime) is grossly disproportionate to the environmental benefit gained from implementing the control measure.	No
Extended pre-start observation period.	P = Yes E = Limited Effectiveness	TGS recognises that by increasing the duration of pre-start visual observations, detectability rates of some marine fauna may increase. On this basis and due to the potential presence of deep/long diving cetacean species such as sperm whale and beaked whales, extending pre-start observations from 30 minutes to 45 minutes was considered. However, this control measure will not be implemented for the following reasons: a) the species identified as deep/long diving cetacean species are HF odontocete species for which modelling predicts that PTS will not occur from exposure to either a single pulse or cumulative exposure over 24 hours. For high-frequency species, TTS is also not predicted to occur from exposure to a single pulse and the onset distance for cumulative TTS is limited to within 100 m of the source; b) the acoustic source is moving continuously at a speed of ~8km/hr and therefore commencing observations earlier would include waters ~4 km further away from where acquisition is planned, meaning tangible benefits to individual species in the acquisition zone are limited; and c) For BW/PBW which are the species expected at greatest densities during the Seismic Survey, 30 minutes of pre-start observations is sufficient based on the following dive times as published by Owen *et al*. (2016) for pygmy blue whales off WA: - Feeding dives mean duration 7.6 min (max. 17.5 min) - Migratory dives mean duration 5.2 min (max. 26.7 min) - Exploratory dives mean duration 8.6 min (max 22.05 min) Cost is grossly disproportionate to the limited environmental benefit gained from implementing the control measure	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Acoustic source model validation.	P = No E = Limited effectiveness	UAM results are extensively used to inform suitable control measures for various receptors (including blue whales/pygmy blue whales) throughout this EP. While it is often considered best practise to undertake a programme of in-field noise measurements at relevant distances from the source to verify the accuracy of model predictions, in practise, this approach can be extremely challenging from both a scientific and logistical perspective. For the proposed Otway Basin 3D MC MSS, the impact assessment has relied extensively upon UAM conducted by JASCO of the 3,480 in^3 acoustic source with a far-field source specification of 248.9 dB re 1 µPa m PK and 225.1 dB 1 $\mu Pa^2 m^2 s$ SEL (10 – 2,000 Hz) in the broadside direction (see **Appendix B** for the UAM report). Predictions from JASCO's Airgun Array Source Model and propagation models have been extensively validated by JASCO globally against underwater acoustic measurement programs in different marine environments from Australia, the United States, Canada, Greenland and Russia (e.g. Hannay and Racca 2005; Aerts *et al.* 2008; Funk *et al*. 2008; Ireland *et al*. 2009; O'Neill *et al*. 2010; Warner *et al*. 2010; Racca *et al*. 2012a, 2012b; Matthews and MacGillivray 2013; Martin *et al*. 2015; Racca *et al.* 2015; Martin *et al*. 2017a, 2017b; Warner *et al.* 2017; MacGillivray 2018; McPherson *et al*. 2018). The large number of measurement programs conducted by JASCO across a range of environments has allowed for a rigorous assessment of the performance of acoustic source and propagation models, and a process of continued improvement to be in place. The models used by JASCO to generate the predictions of underwater noise that underpin this EP are consistently found to be reliable and robust. This provides confidence in the impact assessment which was based on the acoustic modelling results. It is noteworthy that, a verification study for four different acoustic sources in Australian waters found that measured data showed good agreement with the modelling in all cases (McPherson *et al*. 2018). This validation study used fixed loggers on the seafloor which are far superior to streamer-based measurements that have been used previously for the collection of in-field measurements during seismic surveys. With regards to the acoustic array sound source specifications, there is little to no uncertainty in the source model when the acoustic array is a standard type (MacGillivray 2018; McPherson *et al.* 2018). JASCO has confirmed that the proposed acoustic source for the Otway Basin 3D MC MSS fits this description. If the final acoustic source selected for the Otway Basin 3D MC MSS differs to that which was modelled in **Appendix B**, then additional source modelling will be undertaken to confirm whether the sound levels are consistent with levels assessed as acceptable in this EP. Cost is grossly disproportionate to the limited environmental benefit gained from implementing the control measure.	No
Alternative line sequencing to a 'race track' design to avoid sequential lines.	P = No E = Effective	If an alternative line turn sequencing programme was implemented, it could double the line change time. This results in the duration of the survey would be for a lot longer, which has other implications with other marine users and peak-foraging season. With the duration of the survey increasing, this means that the crew are out on the vessel for longer, which can increase HSE exposure and potential conflict with other water users. In addition, increasing the duration of the survey increases the costs to the programme significantly. Cost is grossly disproportionate to the environmental benefit gained from implementing the control measure	No
Alternative methods for detecting marine mammals other than PAM and visual observations (i.e. Active Acoustic Monitoring, and Radio Detection and Ranging (**RADAR**)).	P = No E = Limited/ Unknown Effectiveness	Visual sightings methods using MFOs are restricted to daylight hours and relatively good weather conditions and can only detect whales at the sea surface. Therefore, any additional method for detecting marine mammals during poor sighting conditions would be beneficial, especially during night-time operations and detection of submerged animals. Alternative detection methods include PAM, Active Acoustic Monitoring, and RADAR. TGS will utilise PAM on the Seismic Vessel during the Otway Basin 3D MS MSS. PAM will be operational 24 hours per day while the acoustic source is active and will be continuously monitored by an experienced PAM Operator. Classification to species level from the acoustic detections can only be reliably achieved using PAM, as all other detection methods have not yet been commercially proven or validated (including for detection distance) (Verfuss *et al*., 2018). PAM provides the most cost effective and reliable method to complement visual sightings, despite its limitations for detecting some low frequency vocalisations. Cost is grossly disproportionate to the limited environmental benefit gained from implementing the control measure	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Thermal imaging camera trial.	P = Unknown E = Limited/ Unknown Effectiveness	If available, TGS will trial thermal imaging camera technology to assess its effectiveness to detect large cetaceans during night time. The reliability and accuracy of thermal imaging technology for the use of detecting cetaceans at sea is currently unproven and distance estimates for detections made with the thermal imaging camera will need to be verified against concurrent PAM detections and distance estimates. Should thermal imaging be found to provide reliable detection and distance estimates during one phase of the survey, TGS will commit to using the technology on the Seismic Vessel during subsequent survey phases and will engage additional MFO resources to cover night shifts.	Yes
Prohibition of night-time operations.	P = No E= Effective	Under the standard management procedures for all whales, night-time operations may occur provided that there have not been three or more whale instigated power-down or shut-down situations during the preceding 24-hour period. Decisions on the requirement for this control will be made daily, i.e. at dusk each day, the MFO on-duty will advise whether the threshold of three whale instigated shut-downs was reached in the preceding 24 hours and will therefore confirm if night-time operations can occur. The same applies for low visibility operations where decisions on whether to continue operating will be made each time low visibility conditions arise. For BW/PBW and SRWs, a slightly more conservative approach is proposed as follows: • Low Visibility or Night-time Operations may occur provided that no BW/PBW shut downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); however Low Visibility and Night Time Operations inside the BW BIAs/buffer are contingent on aerial surveys occurring within 7 days prior to acquisition occurring here. • Low Visibility or Night-time Operations may occur provided the no SRW shut downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); however Low Visibility and Night Time Operations inside the SRW Ag BIA/buffer are contingent on aerial surveys occurring within 7 days prior to acquisition occurring here. While excluding night time operations would reduce the probability of a cetacean occurring within the Shut-down Zones without being detected, this approach would double the amount of time and the cost required to acquire the same amount of seismic data. Given the already limited windows for acquisition when accounting for potential weather downtime, and the significant number of seasonal environmental sensitivities, it may not be possible to completed acquisition of individual survey phases if night-time operations do not occur. The control measure of no night-time operations is not considered practicable, as it will result in extending the duration of the overall survey.	No
Use of drones or unmanned aerial vehicles (**UAV**).	P = No E = Limited	The capability of drones in offshore environments is limited by battery life, the distance they can travel and to low wind conditions (~<20 knots). The battery life of UAV's is longer, and they are capable of travelling longer distances, but are still limited to wind conditions of <25 knots. An experienced pilot is needed to operate an UAV and the costs associated with this in an offshore environment are likely to be c. $700/day, excluding the cost of drone hire. It is considered that there would be limited benefit of using a drone/UAV over visual observation by MFOs as both are best suited to optimal conditions. As such, the costs associated with using drones or UAVs to observe for whales are considered to be grossly disproportionate to the benefits gained.	No
Use of acoustic detection systems (e.g. Autonomous Underwater Vehicles, Autonomous Surface Vehicles, moored acoustic systems) for detection of the arrival of pygmy blue whales into the pygmy blue whale foraging BIAs.	P = No E = Unknown Effectiveness	In addition to PAM, other systems for acoustic detection of whales and other cetaceans could be used to increase the ability to detect and avoid animals during the Otway Basin 3D MC MSS. All of these systems have limitations. Moored systems have been successfully used to record acoustic data in the vicinity of the Bonney Upwelling (McCauley *et al.,* 2018; Jolliffe *et al*., 2021), but this did not include real-time or near-real-time access to the data and could not be used for mitigation purposes. Close to real-time monitoring has been implemented from a moored system using surface buoys transmitting data via an Iridium/GPS antenna to mitigate impacts on northern right whales (Baumgartner *et al*., 2019), but this system relies on bespoke stretch hoses and mooring buoys that have highly limited availability and significant costs to install and maintain, and the system is restricted to monitoring in the vicinity of the mooring; detecting whales across significant areas within or adjacent to the pygmy blue whale foraging BIAs is not considered practicable.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		Autonomous Underwater Vehicles and Autonomous Surface Vehicles can be used to detect vocalising whales and dolphins; however, such systems are currently restricted to presence/absence information rather than being able to localise or accurately detect the range to animals. These systems also require significant costs associated with leasing or buying equipment, piloting the systems, and data processing. If used in conjunction with aerial surveys, these systems could provide some additional ability to detect whales and other cetaceans, but the limited availability of equipment and costs associated with implementing these systems outweighs the benefit provided.	
Use of remote sensing data or moored loggers for detection of upwelling sites and potential feeding aggregations (e.g. sea surface temperature, chlorophyll-α) for detection of the arrival of pygmy blue whales into the pygmy blue whale foraging BIAs.	P = No E = Unknown Effectiveness	Remote sensing data or data from moored loggers of environmental parameters could be used to predict upwelling locations and subsequent food sources for blue whales and other marine mammals. Although such data could provide an early indication of the onset of the upwelling season, and therefore help to predict timing of cetaceans arriving in the region to forage, the use of such data to predict whale presence at a fine scale is more limited. Gill *et al*. (2011) noted the first blue whales arriving approximately one week after the onset of upwelling in 2003 and 2004. However, data cannot always be accessed in real-time and upwelling itself does not necessarily equate to cetaceans being present at any given location. In addition, Gill (2023; pers. comm) has indicated that individual upwelling episodes are unlikely to be predictive of PBW presence, rather cumulative upwelling presence influences PBW distribution over the following 12 months; hence there are uncertainties around the interpretation of any upwelling data in relation to PBW distribution. These limitations outweigh any potential benefits.	No
Avoidance of spawning times for commercially targeted fish and crustacean species.	P = No E = Fairly effective	Many fish species within the OA are widely distributed and have extended spawning periods in which they spawn multiple times. Combined spawning periods for the key target species covers most months of the year, and therefore the survey could not be acquired if all spawning periods were avoided. Fish spawning periods were considered in detail as part of the planning process for the Otway Basin 3D MC MSS, noting the importance of spawning and recruitment of fish stocks, but also noting fishes' sensitivity to seismic source is significantly less than that of cetaceans. Significant disturbance to groups of spawning fishes may occur for short periods when the acoustic source passes within hundreds of meters of their location. The spawning periods of the many different key species for the commercial fisheries in the region extent throughout the majority of the year but can vary significantly between species. Most species are highly fecund and spawn over protected spawning periods, thus naturally offsetting potential natural or anthropogenic mortalities. Occasional localised disturbances of groups of spawning fishes may occur, but this is not expected to have a significant impact on stocks due to their high fecundity, protracted spawning periods, biological connectivity through recruitment from across the region, as well as large natural variability in the spawning biomass and recruitment levels. Avoidance of fish spawning periods would provide limited additional environmental benefit at a disproportionate cost (in terms of potential impacts to more sensitive marine fauna and costs associated with additional measures that would likely be required for whales such as additional shut-downs, adaptive management, etc.). Further constraining the survey window and limiting the overlap of the survey with fish spawning periods may mean that the proposed Otway Basin 3D MC MSS could not be completed, therefore this option is not considered practicable.	No
Seismic activities will be restricted to areas outside key commercial fishing areas/seasons.	P = No E = Effective	This would potentially avoid overlap with the commercial fishing operations identified during the consultation programme with relevant persons and the fisheries assessment undertaken. Best efforts have been made to avoid fisheries where possible; however, there will be some overlap, and this will be managed through control measures and ongoing communication for the duration of the survey to minimise conflict and disturbance. TGS will consider adjusting sail lines to accommodate commercial fishers' requests (see below).	No
No operation of the acoustic source within the UXO SDC006 Acoustic Exclusion Area.	P = Yes E = Effective	The potential for seismic emissions to damage the casings containing the mustard gas was raised during consultation with relevant persons, therefore, as a precautionary control measure around UXOs, TGS will implement an Acoustic Exclusion Area of 3 NM around the centre point of UXO site SDS006 within which there will be no activation of the acoustic source (**Figure 84**). This site was an area of chemical munitions dumping (mustard gas).	Yes
A BACI study is implemented prior to the Otway Basin 3D MC MSS commencing.	P = No E = Effective	Developing and completing a BACI study for the active fisheries within and surrounding the OA is a significant undertaking and would need to occur over a long period of time to assure that the methodology and results were robust, representative and consider the inherently high level of natural variability present.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		Many studies have been undertaken on the effects of fish and their response to seismic emissions, with many reporting that fish typically move away from a loud acoustic source if they are uncomfortable with the noise, thereby minimising their exposure and the potential for any deleterious effects. Most studies that are undertaken on fish are essentially represented as worst case scenarios, as the fish are not able to move away from the acoustic source like they can in the wild. The costs of such an extensive BACI study would be grossly disproportionate to the environmental benefit gained from implementing such a control measure.	
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Residual Risk Ranking**
Physiological Effects			
Plankton	Negligible	Likely	Negligible
Benthic Invertebrates	Minor	Likely	Low
Fish	Minor	Likely	Low
Elasmobranchs	Minor	Rare	Low
Cephalopods	Minor	Unlikely	Low
Marine Turtles	Negligible	Rare	Negligible
Low Frequency Cetaceans (Baleen Whales)	Minor	Unlikely	Low
High Frequency Cetaceans	Negligible	Rare	Negligible
Very high Frequency Cetaceans	Minor	Unlikely	Low
Pinnipeds	Negligible	Rare	Negligible
Seabirds	Minor	Rare	Low
Behavioural Effects			
Benthic Invertebrates	Minor	Unlikely	Low
Fish	Minor	Unlikely	Low
Elasmobranchs	Minor	Unlikely	Low
Cephalopods	Minor	Unlikely	Low
Marine Turtles	Negligible	Rare	Negligible
Low Frequency Cetaceans (Baleen Whales)	Minor	Certain	Moderate
High Frequency Cetaceans	Minor	Certain	Moderate
Very high Frequency Cetaceans	Minor	Certain	Moderate
Pinnipeds	Minor	Certain	Moderate
Seabirds	Minor	Unlikely	Low
Perceptual Effects			
Fish	Minor	Possible	Low
Mammals	Minor	Certain	Moderate
Effects to Protected and Sensitive Areas			
AMPs	Minor	Unlikely	Low
BIAs	Minor	Unlikely	Low
KEFs	Minor	Unlikely	Low

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Effects to Relevant Persons			
Commercial Fisheries	Minor	Unlikely	Low
Divers	Low	Rare	Low
UXOs and Defence Activities	Minor	Remote	Low
Cultural and Heritage Values	Negligible	Rare	Negligible
ALARP Statement			
The decision context has been assessed as Type B for all receptors. The corresponding residual risk rankings have been determined to range from **Negligibl**e to **Moderate**. TGS considers the adopted control measures appropriate to manage the impact from acoustic disturbance to the marine environment associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements, good industry practice, using professional experience and taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Alternative and additional control measures were considered, and implemented where effective and practicable, as part of the assessment process. No further additional or alternatively controls were identified. Therefore, the predicted impacts to receptors from acoustic disturbance to the marine environment during the Otway Basin 3D MC MSS are reduced to **ALARP.**			

7.2.6 Impact and Risk Acceptability

Table 85 Demonstration of General Impact and Risk Acceptability for Acoustic Disturbance to the Marine Environment

Context	Acceptability Summary
Residual Risk Ranking	The Residual Risk has been determined to range from **Negligible** to **Moderate**
Ecologically Sustainable Development	There is no threat of serious or irreversible environmental damage or significant impact to biological diversity and ecological integrity associated with underwater sound emission from the acoustic source during the Otway Basin 3D MC MSS. The aspect and potential interactions are well understood and managed in accordance with applicable industry standards and industry good practice. Therefore, the impact is considered to be consistent with the principles of ESD.
TGS's Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	The OA overlaps with BIAs for the following species: whale sharks, BW/PBW, SRW, wedge-tailed shearwater, short-tailed shearwater, wandering albatross, Antipodean albatross, Australasian gannet, white faced storm petrel, common diving petrel, Buller's albatross, shy albatross, Indian Ocean yellow-nosed albatross, black browed albatross, and Campbells albatross. While numerous commercially valuable fish stocks occur in the region, by far the majority of fishing effort occurring inshore of the OA. Based on the UAM results, the maximum residual risk ratings for all animal groups were assessed as **Low**, with the exception of marine mammals. A **Moderate** residual risk rating for behavioural effects and perceptual effects was reported for marine mammals. The OA directly overlaps with two AMPs; the Nelson AMP and the Zeehan AMP which are classified IUCN VI. The OA overlaps with one KEF being the West Tasmania Canyons. Environmental sensitivities within each AMP and KEF have been individually taken into consideration within the EP. Based on the UAM results, the maximum residual risk ratings for all these protected and sensitive areas were assessed as **Low**. Overall, it is considered that through the implementation of the proposed control measures (including precaution zones, MFOs, temporal and spatial measures and adaptive management measures), and the associated operational procedures, the impacts from underwater noise emissions from the Otway Basin 3D MC MSS will not have any serious, long-term or irreversible impacts to ecology or socio-economic values. The Seismic Vessel, and associated acoustic source, will be constantly moving at a speed of 4.5 knots during acquisition. The proposed acoustic source size of 3,480 in^3 is consistent with that used in contemporary MSSs for which there have been little, if any, reported deleterious effects. Therefore, the impacts to the existing environment and identified receptors are likely to be short-term, localised, and rapidly recoverable.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the acoustic disturbance to the marine environment has been determined to range between Negligible to Moderate and will not have a significant impact on a matter of national environmental significance in accordance with Policy Statement 1.1. The NOPSEMA guidance note for petroleum activities and Australian Marine Parks (Guidance Note N-04750-GN 1785 A620236) requires that an EP is developed for undertaking activities such as MSSs to evaluate how environmental impacts and risks will be of an **Acceptable Level** and reduced to **ALARP** and demonstrate that the MSS will not be inconsistent with the relevant marine park management plan. The OA for the Otway Basin 3D MC MSS overlaps with the Nelson AMP and Zeehan AMPS. Despite this, the Otway Basin 3D MC MSS will be undertaken in accordance with the objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013–2023. Each of the environmental sensitivities within the AMPs have been assessed within this EP, where the management of the Otway Basin 3D MC MSS is considered to be consistent with the objectives of the management plan. The relevant measures within the conservation advice and recovery plans have been considered during the development of the control measures that will be implemented during the Otway Basin 3D MC MSS and are considered to be consistent with these recovery plans and conservation advice as described below.

Context	Acceptability Summary
	Conservation Management Plan for the Blue Whale Interim Objective 4 of the 'Conservation Management Plan for the Blue Whale' is to "*ensure anthropogenic threats are demonstrably minimised*" and is to be tested by Target 4-1; "*Robust and adaptive management regimes leading to a reduction in anthropogenic threats to Australian blue whales are in place*". This Conservation Management Plan listed seismic noise as a potential source of anthropogenic noise impacts, which was determined a threat with very high priority for pygmy blue whales. Listed conservation actions to ensure recovery targets are met that are applicable to the Otway Basin 3D MC MSS include: • Assessing the effect of anthropogenic noise on blue whale behaviour; • Anthropogenic noise in BIAs will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area (where 'foraging area' is defined in the 'Guidance on key terms within the Blue Whale Conservation Management Plan'; DAWE, 2021) as any designated foraging BIA); and • Policy Statement 2.1 is applied to all MSSs. The effects of anthropogenic noise on PBWs have been assessed in this EP. Animat modelling was undertaken to understand the specific injury and disturbance risk that the Otway Basin 3D MC MSS poses to PBWs. This modelling incorporated PBW movement data to predict exposure ranges that are significantly more realistic than those produced by UAM. Animat modelling predicted that the maximum distance within which 95% of threshold exceedances would occur for PBW is 130 m for PTS (SEL_{24h}) and 32 km for TTS (SEL_{24h}). Cumulative TTS effects from acquisition on the continental slope are however only expected to occur to c.16 km inshore of the active acoustic source on account of reduced sound propagation in the upslope direction. The 16 km onset distance for cumulative TTS in the inshore direction has been used to define a buffer zone around all of the BW BIAs in the vicinity of the OA. No acquisition will occur within these BIAs or the associated buffer during the 'peak feeding season' from January to June (inclusive) based on the expected consistent and widespread presence of whales in the foraging areas during these months (Gill *et al.*, 2011; 2015; McCauley *et al*., 2018). The only exception to this is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2** in **Appendix M**) and will only take approximately 12 hours to acquire. This spatio-temporal measure has been designed to eliminate any physical or behavioural effects on foraging BW/PBW in the designated BW BIAs during the foraging season; hence, to comply with the requirement of the BW Conservation Management Plan that BWs can continue to use biologically important areas without injury and no BW will be displaced from a foraging area. On this basis, the protection afforded to BW/PBW in the BW BIAs is very strong during the peak months of foraging area use. Operations inside the BW BIAs and the 16 km buffer will be permitted outside these months including during the 'foraging shoulder season' months of September to December and July when whales may be present, but densities are expected to be substantially lower and presence is less consistent. All operations inside the BW BIAs/buffer during the foraging shoulder season will be subject to the use of aerial surveys to assist with BW/PBW detection. Throughout the entire OA and for the full duration of the Otway Basin 3D MSS an Extended Observation Zone[AC] will be implemented to detect BW/PBWs at extended distances from the seismic source and a 7 km Extended Shut-down Zone[AC] for BW/PBW will be adopted. Where 7 km represents the maximum predicted onset distance for behavioural effects for BW/PBW. The adoption of the 7 km Extended Shut-down Zone for BW/PBW will therefore minimise behavioural impacts and prevent the displacement of BW/PBWs from foraging areas inside and outside of the designated BW BIAs. In addition, the 32 km maximum predicted onset distance for TTS has also been utilised in defining several control measures for BW/PBW to manage 1) Seismic Vessel relocations following shut-downs, and 2) the ability for night-time/low visibility operations to occur. In addition, several adaptive management measures will be implemented if higher than anticipated numbers of BW/PBW are encountered. In summary, adoption of Policy Statement 2.1 Part A measures and several Part B measures including the implementation of additional control measures throughout the OA will ensure that BW/PBW will be able to utilise the BIA and surrounds without injury or significant behavioural impacts whilst the Otway Basin 3D MC MSS takes place, and the control measures that TGS will implement are consistent with the required conservation actions for BWs. Based on the proposed control measures (including the temporal and spatial mitigations to be implemented, the 7 km Extended Shut-down Zone and several adaptive management measures), and the species specific Animat modelling to quantify potential impacts, the overall environmental risks from the Otway Basin 3D MC MSS are considered to be reduced to **ALARP** and at **Acceptable Levels** with regard to BW/PBWs and that management of the Otway Basin 3D MC MSS aligns with the objective of the BW Conservation Management Plan. **Conservation Management Plan for the Southern Right Whale** Interim Recovery Objective 5 of the Operative SRW Conservation Management Plan (CoA, 2012) requires that "*Anthropogenic threats are demonstrably minimised*" in accordance with Target 5.1 that requires "*robust and adaptive management regimes leading to a reduction in anthropogenically-induced southern right whale mortality in Australian waters are in place*" and Target 5.2 that requires that "*management decisions are supported by high quality information and high priority research targets identified in this plan are achieved or underway by 2021*". Listed conservation actions to ensure recovery targets are met that are applicable to the Otway Basin 3D MC MSS include: • Assessing anthropogenic noise in key calving areas; • Assessing responses of SRWs to anthropogenic noise; and • If necessary, developing further mitigation measures for noise impacts. The operative SRW Conservation Management Plan also states that "*noise interference is of particular concern within or close to SRW aggregation areas where young calves are present and whales are resident for long periods of time*"; hence control measures that will be implemented during the Otway Basin 3D MC MSS for this species have been designed to address these specific noise impacts. The operative SRW Conservation Management Plan also recognises that "*noise may also deter whales from establishing aggregations in otherwise suitable but currently unused habitat and disrupt migratory movements, thereby preventing individuals from using preferred habitats*". While there is another designated 'known core range' BIA in the area, the OA only marginally overlaps with this, and the expectation is that animals traverse this area on their way to and from the more coastal aggregation areas and connecting habitat. Strong adaptive management measures have been developed to address potential noise effects in the wider area; hence to minimise impacts on migrating SRWs.

Context	Acceptability Summary
	The effects of anthropogenic noise on SRWs have been assessed in this EP. Animat modelling was undertaken to understand the specific injury and disturbance risk that the Otway Basin 3D MC MSS poses to SRWs (both mother-calf pairs and all other cohorts). This modelling incorporated SRW movement data to predict exposure ranges that are significantly more realistic than those produced by UAM. Animat modelling predicted that the maximum distance within which 95% of threshold exceedances would occur for SRWs is 40 m for PTS (SEL_{24h}) and 11 km for TTS (SEL_{24h}). Based on these results, TTS effects are not predicted to extend from the OA into the Aggregation BIA (which occurs 14 km north of the OA) or any of the connecting habitat, migration and resting on migration BIAs that occur further afield in coastal waters. The predicted onset distance for behavioural effects for SRWs were assessed separately for 'mother-calf pairs' and 'other individuals' as 31.5 km and 6.1 km respectively. In addition to the Animat modelling results the maximum-over-depth acoustic modelling results indicate that the 140 dB (SPL) behavioural effects threshold may indeed be exceeded approximately 42 km inshore of acquisition on the continental shelf. Hence behavioural effects on mother-calf pairs could occur in the SRW Ag BIA. The 42 km onset distance for behavioural effects for mother-calf pairs has been used to define a buffer zone around the SRW Ag BIA that lies inshore of the OA. No acquisition will occur within this BIA or the associated buffer during the during the core aggregation months of May to September. The only exception to this is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2** in **Appendix M**) and will only take approximately 12 hours to acquire. This spatio-temporal measure has been designed to eliminate any physiological or behavioural effects on SRWs in the SRW Ag BIA during the months over which SRWs are expected to be present. On this basis, compliance with Interim Recovery Objective 5 of the operative SRW Conservation Management Plan that anthropogenic threats are demonstrably minimised, is achieved. This control also aligns with the recommendation that seismic surveys should be undertaken outside of biologically important areas at biologically important times. The adoption of these controls ensures that the protection afforded to SRWs in the SRW Ag BIA is very strong during the core aggregation period. Operations inside the SRW Ag BIA and the 42 km buffer will be permitted outside these months including during the aggregation shoulder months of April and October. All operations inside the SRW Ag BIA/buffer during the shoulder months will be subject to the use of aerial surveys to assist with SRW detection. Throughout the entire OA and for the full duration of the Otway Basin 3D MSS an Extended Observation Zone[AC] will be implemented to detect SRWs at extended distances from the seismic source and a 7 km Extended Shut-down Zone[AC] for SRW will be adopted. In keeping with the Shut-down Zone with BW/PBW, 7 km has been selected as the Shut-down Zone for SRW, to conservatively address the maximum predicted onset distance of 6.1 km for behavioural effects on individual (i.e., unaccompanied) SRWs. The adoption of the 7 km Extended Shut-down Zone for SRW will therefore minimise behavioural impacts both inside and outside of the designated SRW Ag BIA and throughout the 'known core range' BIA. In addition, the 42 km maximum predicted onset distance for behavioural effects on mother-calf pairs has also been utilised in defining several control measures for SRWs to manage 1) Seismic Vessel relocations following mother-calf pair instigated shut-downs, and 2) the ability for night-time/low visibility operations to occur. In addition, several adaptive management measures will be implemented if higher than anticipated numbers of SRW are encountered. In summary, adoption of Policy Statement 2.1 Part A measures and several Part B measures (as summarised above) will ensure that SRWs will be able to utilise the OA without injury or significant behavioural impacts whilst the Otway Basin 3D MC MSS takes place and ensures consistency with the objective of the SRW Conservation Management Plan (that anthropogenic threats are demonstrably minimised) is achieved. Hence, the control measures that TGS will implement are consistent with the required conservation actions for SRWs in the operative SRW Conservation Management Plan. While the Draft National Recovery Plan for the Southern Right Whale (CoA, 2022) is not yet operative, once finalised it will supersede the operative conservation management plan. The conservation actions included in the draft plan have also been considered in this EP (see **Table 79**) and are also addressed by the proposed controls. Based on the proposed control measures (including the temporal and spatial mitigations to be implemented, the 7 km Extended Shut-down Zone and several adaptive management measures), and the species specific Animat modelling to quantify potential impacts, the overall environmental risks from the Otway Basin 3D MC MSS are considered to be reduced to **ALARP** and at **Acceptable Levels** with regard to SRWs and that management of the Otway Basin 3D MC MSS aligns with the objective of both the operative SRW Conservation Management Plan and the Draft National SRW Recovery Plan. For all other species of baleen whale, conventional UAM results predicted that 24-hour cumulative PTS could occur out to a maximum of 500 m, but that exposure to a single pulse from the active acoustic source would not elicit PTS even if an animal was very close to the source (< 20 m) (**Table 70**). The maximum onset distance for 24-hour cumulative TTS is predicted to be 156 km while the single pulse onset distance for TTS is 70 m. On the basis that other baleen whales are probably only present in the OA at low densities (see **Table 25**) and that UAM does not account for animal movement or the movement of the Seismic Vessel, the 24-hour cumulative UAM results were considered to be excessively conservative for defining the extent of observation or shut-down zones for other baleen whales. It is noteworthy that over a 24-hour period the Seismic Vessel could travel up to 200 km; hence 24-hour cumulative exposure over the 156 km TTS onset distance and the 500 m PTS onset distance is unlikely for baleen whales. As a precaution, an Extended 2 km Shut-down Zone for all other whales will be adopted throughout the OA and this will serve to provide complete protection from short-term exposure to underwater noise for these species. In addition, adaptive management measures will be implemented to provide further protection to these other species of whale. **<u>Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale):</u>** Conservation and Management Actions for humpback whales have been outlined in the Humpback Whale Conservation Advice and include "*assessing and addressing anthropogenic noise: shipping, industrial and seismic surveys*". All mitigation measures listed within the Conservation Advice are included within the proposed control measures and will be implemented throughout the Otway Basin 3D MC MSS, this also includes the adoption of all Policy Statement 2.1 Part A measures and certain Part B measures (including extended Precaution Zones, use of MFO, spatial and temporal adaptive management procedures, such as limits on night-time/low visibility operations and vessel location in certain circumstances, and the use of PAM), and the undertaking of UAM. The mitigation measures in place for the Otway Basin 3D MSS will adhere to the requirements of the Conservation Advice and will assist with reducing potential noise impacts and risks to **ALARP** so that any potential impacts are managed to an **Acceptable Level** with regard to humpback whales and that the Otway Basin 3D MSS will be carried out in a way that will be consistent with the Humpback Whale Conservation Advice. **<u>Conservation Advice for Sei and fin Whales</u>** No further mitigation measures have been provided in the Conservation Advice for sei and fin whales to address anthropogenic noise; however, those mitigations adopted to address potential impacts on BW/PBW will be of substantial benefit to sei and fin whales given their feeding association with the regional upwelling system as well. Adoption of Policy Statement 2.1 Part A measures and several Part B measures will be implemented to reduce the potential noise impacts and risks to **ALARP** and **Acceptable Levels** with regard to sei and fin whales, and the survey will be consistent with the Conservation Advice for these species. **<u>Conservation Advice for the Australian sea lion</u>:** The Conservation Advice for Australian sea lions recognises that exposure to sharp, short sounds of moderate intensity for extended periods (e.g. from MSSs) may cause avoidance behaviour and/or hearing threshold changes in pinnipeds. Seismic pulses may also affect bony fish which pinnipeds feed on. No standards for managing noise impacts from MSSs (or other noise sources) are specified. The impact assessment has demonstrated that no significant or long-term disturbance or injury to Australian sea lions is predicted, and the level of impact and risk is considered to be acceptable. **<u>Conservation Advice for the Australian sea lion</u>:**

Context	Acceptability Summary
	The Conservation Advice for Australian sea lions recognises that exposure to sharp, short sounds of moderate intensity for extended periods (e.g. from MSSs) may cause avoidance behaviour and/or hearing threshold changes in pinnipeds. Seismic pulses may also affect bony fish which pinnipeds feed on. No standards for managing noise impacts from MSSs (or other noise sources) are specified. The impact assessment has demonstrated that no significant or long-term disturbance or injury to Australian sea lions is predicted and the level of impact and risk is considered to be acceptable. **Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017)** Although the impact of anthropogenic activities, specifically anthropogenic noise, has been identified within the Recovery Plan for Marine Turtles in Australia, there are few specific requirements with regard to management actions which may address effects on marine turtles. The OA for the Otway Basin 3D MC MSS does not overlap with any areas identified as BIAs for marine turtles and high numbers of marine turtles are not expected to be encountered during the Otway Basin 3D MC MSS. As a precaution, TGS will adopt several control measures to ensure the Otway Basin 3D MC MSS is sufficient to meet the requirements of, and undertake the activity consistent with, the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017). In particular, TGS will adopt a precautionary 100 m Shut-down Zone from the operating acoustic source for marine turtles whereby the acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting. Tail buoys on the streamers will also be fitted with turtle guards, of be of a design that does not pose an entrapment risk to marine turtles. **Draft Wildlife Conservation Plan for Seabirds 2019** Under the Draft Wildlife Conservation Plan for Seabirds 2019, effects of anthropogenic disturbance to seabird breeding and roosting areas are to be managed. Given the open ocean nature of the Otway Basin 3D MC MSS no disturbance effects from underwater noise are predicted for breeding or roosting sites therefor no specific additional measures are required to reduce potential noise impacts and risks to **ALARP** and **Acceptable Levels** for seabirds. **Recovery plan for the White Shark (*Carcharodon carcharias*)** The Recovery Plan for the White Shark does not identify sound as a threat to the species. Acoustic emission impacts from the Otway Basin 3D MC MSS are not predicted on white sharks. Actions are considered consistent with the objective of facilitating recovery of white sharks. **AMP Values, Management Prescriptions and IUCN Reserve Management Principles** No population level impacts or serious or irreversible ecological implications to AMPs within the OA are predicted to occur as a result of acoustic disturbance to the marine environment. Therefore, the biological diversity and sustainability of the AMPs are considered to be conserved. There are no predicted impacts to the ongoing sustainable use, where permitted, of the AMPs within the OA. The activity is consistent with the IUCN management prescriptions and permissible use of the AMPs. **Conservation values and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023** NOPSEMA Guidance Note "*Petroleum activities and Australian Marine* Parks' states that "*Petroleum activities may be allowable in Multiple Use Zones and Special Purpose Zones (IUCN category IV) subject to environmental approvals and demonstration that environmental impacts will be consistent with the relevant management plan"* and that "*Titleholders undertaking petroleum activities in Australian waters must ensure that any potential environmental impacts from the petroleum activities are managed to be consistent with the relevant management plan".* There are no predicted severe or long-term impacts to individual species or ecological populations as a result of the acoustic disturbance to the marine environment. Therefore, the biodiversity and ecosystem health of the SEMR Network is considered to be conserved. The predicted impacts are not inconsistent with the requirements of the Conservation Advice, Recovery Plans and Management Plans associated with the EPBC Act listed species identified. The activity is consistent with the goals and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023.
Social Acceptance – Relevant Person Expectations	Relevant persons have noted concerns regarding the potential for the survey to impact on SBTF fishing operations and interfere with the migration of SBT. Given the limited sensitivity of SBT to sound, behavioural effects will be localised and short term, and no impacts to migration are expected. Control measures have been proposed to manage seismic acquisition with the industry. Concerns have been raised regarding the impacts of seismic on primary productivity and the food web, commercial fishery catch rates and the SBT migration. Impacts to all have been assessed and the residual risk is considered to be low. Fishers in the TAS giant crab and rock lobster fisheries, raised concerns regarding to adults and larvae (recruitment). The exclusion of acquisition within water depths less than 1,000 m adjacent to the TAS fisheries was also requested. Noting that the TAS giant crab stock is currently assessed as depleted, TGS have adopted the requested exclusion. It was acknowledged that that the Otway Basin 3D MC MSS is mostly located offshore in deep waters that avoid most rock lobster fishing effort, but concerns were noted regarding the effects of seismic on rock lobster and rock lobster larvae. The relevant person also explained that some deep water fishing effort occurs occasionally for white lobster and requested that the survey be modified to avoid these areas. Although no such exclusion has been adopted by TGS for rock lobster, the AA already avoids depths and most areas where any fishing effort has previously occurred. The exclusion zone defined for TAS giant crab also has some indirect benefit in this respect for rock lobster. No significant impacts to rock lobster recruitment or to fishing activities is expected. Several relevant persons questioned TGS over potential compensation to commercial fishers who experience financial loss as a result of the Otway Basin 3D MC MSS. TGS has developed a commercial fisheries compensation protocol, whereby fishers who experience an economic loss as a result of damage to fishing gear, displacement, or loss of catch may lodge a claim for compensation to be assessed by a third-party independent assessor. This has been provided as **Appendix N** of this EP. One relevant person highlighted the potential utilisation of offshore waters and the STC for foraging PBWs. This has been factored into the assessment. TGS has developed the control measures for marine mammals (particularly SRW and BW/PBW) with relevant persons with expertise in blue whales and aerial surveys. Marine Parks Australia, on behalf of the Director of National Parks, responded during consultation with concerns on impacts to AMPs. Impacts to values of the AMP network will be managed such that there is no long term impact to the biological diversity and values of the AMPs. TAS relevant persons raised concerns on the potential disruption of foraging in sooty shearwaters/muttonbird; a species with cultural significance. Impacts to plankton have been assessed within this EP and it is considered that there will be no significant impacts to plankton communities and therefore knock-on effects on sooty shearwaters (and seabirds in general).

Context	Acceptability Summary
	Relevant persons also raised concerns regarding a WWII munitions dump site. TGS has implemented an exclusion area around this UXO dump site to ensure there will be no impacts to the integrity of the munitions casings from acoustic emissions. General concerns raised during the preparation for this EP included potential impacts on plankton/zooplankton, whales, SBT, and spawning. These potential impacts have all been assessed throughout this EP. All concerns raised by relevant persons were considered as part of the EP process and responses were provided to all submissions with further information or feedback as necessary. Results of the impact assessments have been summarised and provided to all relevant persons, when requested. Engagement with all relevant persons will continue for the duration of the EP. All submissions and associated response are provided in **Appendix H**. Detailed literature reviews and UAM were included in the development of the EP and an extensive set of control measures to reduce the overall impacts from the Otway Basin 3D MC MSS on the marine environment and those relevant persons that use the marine environment for their economic wellbeing, to **ALARP** and an **Acceptable Level**.
External Context – Commonwealth and State Legislative Criteria	The Otway Basin 3D MC MSS will comply with all relevant legislative requirements, in particular Policy Statement 2.1 Part A measures. Under Part B of Policy Statement 2.1, various measures are recommended when the likelihood of encountering whales is moderate to high. Several control measures will be implemented for the duration of Otway Basin 3D MC MSS in accordance with Part B of Act Policy Statement 2.1.
Industry Best Practice	The proposed control measures follow industry best practice and best practice guidelines, including: • Adoption of Policy Statement 2.1 which is considered Industry Best Practice for minimising the effects of MSSs on marine mammals. Control measures will be implemented for the duration of the Otway Basin 3D MC MSS and these measures have been developed in accordance with Policy Statement 2.1 (i.e. soft-starts, Precaution Zones, MFOs), as well as through discussion with experts in the field of marine mammals (i.e. Blue Whale Study). Where appropriate, TGS has provided increased protection for marine mammals above that which is required within Policy Statement 2.1, for example through the use of Extended Observation and Shut-down Zones, and aerial surveys; • Development of a Commercial Fisheries Compensation Protocol to ensure that seismic acquisition is undertaken in a manner that prevents any increased cost encumbrance or loss of income to commercial fishing licence holders. • The IAGC Environmental Manual for Worldwide Geophysical Operations which includes recommended mitigation measures for cetaceans to minimise acoustic disturbance during geophysical operations. These measures include, but are not limited to: • Use of Soft-start Procedures; • Providing basic awareness training to the entire crew; have them immediately report any cetacean observation to the bridge; • Reporting immediately to local authorities any animals in distress, animal carcasses, etc.; and • The APPEA Code of Environmental Practice which includes objectives to reduce the impact on cetaceans and other marine life to ALARP and to an Acceptable Level by ensuring operations are in accordance with legislative requirements and demonstrate the implementation of appropriate management measures.
ALARP	The decision context has been assessed as Type B for all receptors. The corresponding residual risk rankings have been determined to range from Negligible to Moderate. TGS considers the adopted control measures are appropriate to manage the impact from acoustic disturbance to the marine environment associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements, good industry practice, using professional experience, and taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to relevant persons. Alternative and additional control measures were considered, and implemented where effective and practicable, as part of the assessment process. No further additional or alternatively controls were identified. Therefore, the predicted impacts to receptors from acoustic disturbance to the marine environment are reduced to **ALARP.**

Table 86 Demonstration of Specific Impact and Risk Acceptability for Acoustic Disturbance to the Marine Environment

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
Plankton	Principles of ESD, specifically no serious or irreversible environmental damage and the conservation of biological diversity and ecological integrity.	Impacts to plankton communities are localised (within 100s of m from the acoustic source) and recoverable (< 1 week to recover). Note that the latter is considered sufficient to protect against population level impacts and impacts to the recruitment levels at surrounding habitats.	Overall, there is the potential for localised, short-term impacts to zooplankton as a result of the Otway Basin 3D MD MCC; however, population recovery is expected within days after the Otway Basin 3D MD MCC has ceased and no lasting ecosystem population impacts are expected.	Yes
Benthic Habitats	Principles of ESD, specifically no serious or irreversible environmental damage and the conservation of biological diversity and ecological integrity.	No detectable impacts to habitat forming benthic primary producers as a result of the Otway Basin 3D MC MSS.	The threshold value of 226 dB re 1 µPa PK was not reached at any of the modelled sites analysed within the UAM. Therefore, no detectable impacts to benthic habitat forming species such as sponges and corals are expected.	Yes

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
Benthic Invertebrates	Principles of ESD, specifically no serious or irreversible environmental damage and the conservation of biological diversity and ecological integrity.	Impacts to crustaceans and bivalves arising from the Otway Basin 3D MC MSS will not result in mortality rates beyond the natural range of variation.	The no-effect criteria for crustaceans of 202 dB re 1 µPa PK-PK, was modelled as being detectable at no greater than 512 m from the acoustic source. Given that this threshold represents no observed effects, any crustaceans inhabiting seabed areas at between 512 m and 500 m are considered to exist in areas that are on the outer margins of potential for sub-lethal effects. The area of the AA that lies at between 500 and 520 m is 2.5 km^2 which is 0.0005% of the total AA. The sublethal-effect criteria of 209 - 213 dB re 1 µPa PK-PK for crustaceans was modelled as being detectable at no greater than 157 m from the acoustic source. Given that the seabed is no shallower than 500 m in areas where 3D seismic activities will occur, this level of sub-lethal effects is highly unlikely to occur. Despite the potential vulnerability to seismic emissions of benthic invertebrates due to their limited mobility, the studies that produced the effects threshold criteria adopted here concluded that mortality rates observed during exposure to seismic sound were within the natural range of variation which may be expected to occur due to changes in environmental conditions and anthropogenic stressors. On the basis that any potential sublethal effects to invertebrates in areas shallower than 512 m will be sub-lethal and temporary and that existing literature has found that effect levels at the effect thresholds adopted here potentially fall within the range of existing background variability, the level of consequence is considered minor and the likelihood that minor effects will occur in this area is likely.	Yes
Non-Listed Marine Fauna (Cephalopods Fish, Sharks, Rays)	Principles of ESD, specifically no serious or irreversible environmental damage and the conservation of biological diversity and ecological integrity.	No serious or irreversible damage to a population of any Non-listed marine fauna species as a result of the Otway Basin 3D MC MSS.	**Cephalopods:** The evidence suggests that no serious physiological impacts to individuals or larvae will occur as a result of the Otway Basin 3D MC MSS. The life history traits of cephalopods mean they are well adapted to disturbance and appear to become habituated to acoustic release, displaying other behaviours which indicate rapid recovery. Therefore, no serious or irreversible risks to cephalopod populations are predicted. **Fish:** Consistent with the fisheries management principles, key indicator species have been considered representative of the full fish assemblage which may exist within the OA and relevant distances to thresholds. As described below, no serious or irreversible impacts to key indicator fish populations to the extent that sufficient spawning fish biomass and recruitment of stock may be compromised are predicted. **Sharks and Rays:** No serious or irreversible damage to shark and ray populations are expected.	Yes
EPBC Act Listed marine fauna (White Sharks, Marine Turtles, Marine Mammals, Seabirds)	**Marine Mammals** EPBC Act Part 3 (18A and 20A); EPBC Act Significant Impact Guidelines 1.1; Conservation Management Plan for the Blue Whale; Conservation Management Plan for the Southern Right Whale 2011-2021;	Impacts to EPBC Act Listed marine fauna are limited to minor, short term effects to individuals and ensure biologically important behaviours can continue, within and outside nominated BIAs.	The 16 km buffer zone around the BW BIAs, exclusion of seismic operations within the BW BIAs/buffer during the peak feeding season, the 7 km Extended Shut-down Zone, and the adaptive management controls for BW/PBW have been designed to eliminate any physical or behavioural effects on feeding BW/PBW, hence, to comply with the requirements of the Blue Whale Conservation Management Plan whereby this species can continue to use biologically important areas without injury and that no BW/PBW is displaced from a foraging area.	Yes

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
	Draft National Recovery Plan for the Southern Right Whale (*Eubalaena australis*); Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale); Approved Conservation Advice for *Balaenoptera borealis* (sei whale); Approved Conservation Advice for *Balaenoptera physalus* (fin whale); Recovery Plan for the Australian sea lion (*Neophoca cinerea*); and Conservation Advice *Neophoca cinerea* (Australian sea lion).		The 42 km buffer zone around the SRW Ag BIA, exclusion of seismic operations within the BIA/buffer during the core aggregation months, the 7 km Extended Shut-down Zone, and the adaptive management controls for SRWs have been designed to minimise any physical or behavioural effects SRWs, hence, to comply with the requirements of both the operative SRW Conservation Management Plan and the Draft National Recovery Plan for the SRW whereby anthropogenic threats are demonstrably minimised, and operations adjacent to SRW BIAs do not prevent any SRW from utilising the area or cause injury or disturbance. While the extended 2 km Shut-down Zone for all 'other whales' does not eliminate the risk of cumulative TTS, it provides strong protection from short-term exposure to high levels of underwater noise and both vessel and animal movement will ensure that the likelihood of physiological impacts on other whales remains low. Single-pulse PTS is not predicted for baleen whales (of which some have an EPBC threatened listing) within the limits of the modelling resolution (20 m) and single pulse TTS would only occur if an animal was exposed within 70 m of the source. On this basis, significant injury effects (PTS or TTS) could only occur if a whale went undetected inside the proposed precaution zones or if they remained in the general vicinity of the active source for 24-hours; both vessel and animal movement will ensure that the likelihood of this occurring is very low. On this basis effects will be limited to minor and short-term effects on individuals. Regarding the continuation of biologically important behaviours of 'other whales'; while avoidance behaviours are expected within 12 km of the acoustic source and serve to protect against hearing injury, other EPBC listed whales are probably only present in and around the OA at low densities and the OA does not overlap with habitat identified as biologically important for these species; hence significant effects on biologically important behaviours are not expected.	

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
	Marine Turtles EPBC Act Part 3 (18A and 20A) EPBC Act Significant Impact Guidelines 1.1 Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017)	Impacts to EPBC Act Listed marine fauna are limited to minor, short term effects to individuals and ensure biologically important behaviours can continue, within and outside nominated BIAs.	Industry practice seismic levels associated with PTS and TTS attributable to acoustic emissions in marine turtles is 232 dB_{peak} and 226 dB_{peak}, respectively. Based on the UAM (Welch *et al.,* 2023) these thresholds are expected to be experienced at a maximum distance of 110 m (PTS) and 310 m (TTS). Based on the UAM (Welch *et al.,* 2023), sound pressure levels associated with behavioural response (166 dB re 1µPa) and disturbance (175 dB re 1µPa) were not detected at horizontal distances greater than 4.18 km and 1.37 km, respectively. The OA has not been identified as an area particularly important to marine turtles (i.e. there are no BIAs identified within, or in the vicinity of, the OA) and as such, the presence of marine turtles in the OA during the Otway Basin 3D MC MSS is expected to be low. Marine turtles are therefore unlikely to experience PTS/TTS effects as a result of the Otway Basin 3D MC MSS, which are predicted to be minor and short-term, should they occur. Where they do occur, behavioural effects to marine turtles are predicted to be minor, short-term and affect the small number of individuals that may be transiting the OA. Due to the transient nature of the active acoustic source, whereby the Seismic Vessel will travel at a speed of 4.5 knots, and based on the modelled ranges for behavioural response and disturbance, an individual turtle may respond the acoustic source for approximately one hour and exhibit stronger signs of disturbance for less than 30 minutes. No population level impacts are predicted and the risk to marine turtles is already low.	Yes
	White Sharks EPBC Act Part 3 (18A and 20A) EPBC Act Significant Impact Guidelines 1.1 Recovery Plan for the White Shark	Impacts to EPBC Act Listed marine fauna are limited to minor, short term effects to individuals and ensure biologically important behaviours can continue, within and outside nominated BIAs.	Industry practice seismic levels associated with mortality or mortal injury attributable to seismic emissions on fish with no swim bladders (applicable to whale sharks) is >213 dBpeak. Based on the UAM (Welch *et al.,* 2023) this threshold is expected to be experienced a maximum of 70 m. There is a slight overlap of the OA with the distribution and known distribution BIAs of the white shark, however, this overlap is limited to along the north-eastern to south-eastern boundaries of the OA, limiting the likelihood that white sharks would be utilising the deep waters of the OA. Should white sharks be present within the OA during the survey period, it is expected that these highly mobile individuals would actively avoid the area of acoustic emissions should it be having a negative effect on an individual. Given their limited sensitivity to sound and transient nature of the acoustic emissions, whereby the Seismic Vessel will move at a speed of 4.5 knots, behavioural disturbances to white sharks are predicted to be limited to short-term and one-off disturbances to individuals, should they occur. On this basis, elicitation of potential avoidance behaviours in response to the acoustic source are not expected to displace white sharks from within the BIA or preclude the continuation of biologically important behaviours, noting that the seismic sound emissions have not been identified as a threat to white sharks within the Recovery Plan.	Yes

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
	Seabirds Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2019)	Impacts to EPBC Act Listed marine fauna are limited to minor, short term effects to individuals and ensure biologically important behaviours can continue, within and outside nominated BIAs.	Birds on the sea surface are unlikely to suffer physiological effects as the Lloyd Mirror effect means that noise levels at the surface are lower than those deeper in the water column. However, studies suggest physiological damage might occur to those seabirds exhibit diving behaviours and which are in extremely close proximity to the acoustic source. Seabirds chase small bait fish as their prey, and it is likely that these small fish would be displaced from the immediate vicinity of the active acoustic source. Seabirds are expected to detect this change in fish distribution and cease any foraging, which would in turn reduce their exposure to any potential physiological effects. Therefore, any impacts to seabirds are predicted to be minor, short term and effect only a small number of individuals. The OA overlaps with the BIAs of 12 species, with these BIAs identified as important foraging areas. Based on the limited effects on seabirds and their prey species, as discussed in the EP, biologically important behaviours are predicted to continue, within and outside the nominated BIAs.	Yes
Marine Protected Areas and Sensitive Areas	EPBC Act South-east Marine Parks Network Management Plan 2013 – 2023 Australian IUCN Reserve Management Principles for Commonwealth Marine Protected Areas	• Meet the Zeehan and Nelson AMP IUCN Category VI (Multiple Use Zone) objective to provide for ecologically sustainable use while conserving ecosystems, habitats and native species. • The Otway Basin 3D MC MSS is undertaken in a manner consistent with the requirements of the South-east Marine Parks Network Management Plan 2013 - 2023 • The ecosystem function and integrity of Commonwealth Marine Areas are maintained.	There are no predicted severe or long-term impacts to individual listed species as a result of the acoustic disturbance to the marine environment and no impacts to ecological populations, habitat or functions are expected to occur. The control measures proposed will serve to protect benthic invertebrates from sub-lethal effects and mortality or mortal injury for site-attached fish (including those commercially targeted) from the Otway Basin 3D MC MSS. Therefore, the Otway Basin 3D MC MSS meets the objectives to: • Provide for ecologically sustainable use while conserving ecosystems, habitats and native species within the Zeehan and Nelson AMP. • Conserve the biodiversity and ecosystem health of the South-east Marine Region • Maintain the ecosystem function and integrity of Commonwealth Marine Areas, including KEFs.	Yes
Commercial Fisheries	The peak industry body representative for commercial fishing, raised concerns regarding the potential effects of the Seismic Survey on commercial catch level. Commercial fisheries data and publications used to inform the impact assessment include: • ABARES Fishery Status Reports 2021 (Patterson *et al.*, 2021); • Commercial fishing catch and effort data for the recent five-year period 2016 – 2020 was obtained from the ABARES, VFA, DNRET and PIRSA which allowed spatial and temporal patterns in fisheries catch and effort distribution to be assessed; and	• No interference with other marine users to an extent greater than is necessary for the exercise of right conferred by the titles granted. • No change to the sustainability status of the fishery; the Otway Basin 3D MC MSS is undertaken in a manner that does not result in serious, irreversible or long-term impacts to key indicator commercial fish populations and to the extent that sufficient spawning fish biomass and recruitment of the stocks may be maintained such that stocks continue to be assessed as sustainable. • There is no increased costs or loss of income for commercial fishing license holders.	The predicted level of interference to commercial fisheries is no greater than is necessary to exercise of right conferred by the titles granted to carry out exploration activities. Based on the detailed evaluation undertaken in **Sections 7.2.2.2.3, 7.2.2.3.2 and 7.2.2.4.1**, the predicted level of impact from acoustic emissions do not exceed the defined acceptable level, given that: • No significant changes in the diversity and abundance of fish species on various reef and non-reef habitats in western Australia have been reported to occur following exposure to seismic emissions. Studies include contemporary investigation of acoustic impacts on commercially important species such as snapper, emperor and groupers, on the North-west Shelf.	Yes

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
	• TGS commissioned the SETFIA to compile an additional review of the level of catch made by Commonwealth and State-managed fisheries within the OA, the proportion of each fisheries' total allowable catch and the annual average catch value that it represents (based upon data from the ten years prior to 2021).		• Despite the potential vulnerability of site attached fish with limited mobility to acoustic emissions, assemblages that have been exposed anthropogenic acoustic disturbances have been reported to exhibit high levels of resilience and quick recovery following exposure. • Commercially important pelagic species such as mackerels do not have a large swim bladder, if present at all, and as such mortality and mortal injury are predicted to occur within a maximum horizontal distance of 80 m from the acoustic source. Species that inhabit the pelagic environment can avoid areas that exceed current conservative industry practise levels. Moreover, as the seismic emission source is moving pelagic fishes would have a period as the source approaches to avoid the area and thus avoid exposure to levels that may cause mortality or mortal injury. • Under a 'worst-case' scenario, the reported mortality rates for fish (cod, saithe, herring, turbot and plaice) larvae and fry due to exposure to acoustic emissions did not approach or exceed natural rates of mortality. • The overall conclusion from the behavioural seismic acoustic exposure experiments was that there was minimal impact on fish behaviour and that any changes that were observed were short term and unlikely to have caused any significant biological or ecological impacts (Woodside, 2007). • Pelagic fish that target zooplankton as prey could be subject to indirect effects associated with changes to the abundance and distribution of zooplankton. These potential flow-on effects to marine food webs are expected to be spatially restricted to within a few kilometres of the Seismic Vessel with baseline conditions resuming relatively quickly after the survey line is complete. The energetic consequences of a small shift in foraging habitat will likely be negligible for pelagic fish. • Where they do occur, reported reductions in catch rates of fish following exposure to acoustic emissions are predicted to be temporary. Based on the available evidence, fish are expected to return to normal behaviour and distributions within days of acoustic exposure. Likewise, catch rates have been observed to return to pre-survey levels following the cessation of acoustic emissions. • Overall, no serious, irreversible or long-term impacts to key indicator commercial fish populations to the extent that sufficient spawning fish biomass and recruitment of stock may be compromised are predicted to occur. On this basis, the sustainability status of the fishery is predicted to be conserved.	

Receptor	Relevant External Context	Defined Acceptable Level	Comparison with Predicted Levels of Impact	Acceptable
			• A Commercial Fisheries Compensation Protocol will be implemented to formally manage claims by commercial fishers for loss of catch, displacement and lost or damaged fishing gear as a consequence of the Otway Basin 3D MC MSS.	
Divers	UK Diving Medical Advisory Committee (DMAC) Safe Diving Distance from Seismic Surveying Operations 2019.	No health impacts to divers or underwater recreational activities as a result of the Otway Basin 3D MC MSS.	No recreational diving is expected to occur within the OA, with recreational diving typically constrained to coastal waters of 30 m or less. Commercial dive operations may occur in the vicinity of the OA around petroleum facilities. All petroleum operators have been consulted with during the preparation of this EP, with this consultation continuing for the life of the EP. TGS will provide look ahead plans to petroleum operators. TGS will conduct a joint risk assessment and planning/mitigation between parties where diving operations will occur within 30 km and will make all parties aware of the Otway Basin 3D MC MSS where diving and seismic activities will occur within 45 km of each other. Should new diving activities be identified, the adopted control measures regarding notification of survey commencement to diving operators and the need to conduct joint risk assessment where diving and seismic activities occur within 30 km of each other, ensure that no health impacts to divers will occur as a result of the Otway Basin 3D MC MSS.	Yes

Acceptability Statement
Impacts and risks classified as ‘Type B’ or above are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined Acceptable Levels for that impact or risk, including those described in **Table 52**. Based on the above evaluation, the potential impacts from acoustic disturbance to the marine environment meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of acoustic disturbance to the marine environment on all receptors, including the associated disruption and interference with other marine users to an **Acceptable Level.**

7.2.7 Environmental Performance

Table 87 Environmental Performance Outcomes, Standards and Measurement Criteria for Acoustic Disturbance to the Marine Environment

Number	Environmental Performance Outcome	Environmental Performance Standard
EPO 4	Seismic acquisition is undertaken in a manner that limits impacts from underwater noise to individual listed threatened, listed migratory or listed marine fauna protected under the EPBC Act to minor, short term effects and do not preclude the continuation of biologically important behaviours.	**EPS 53** to- **EPS 88**, **EPS 111** to **EPS 162**
EPO 5	Seismic acquisition is undertaken in a manner that prevents serious or irreversible damage to a population of marine fauna species not listed as threatened or migratory under the EPBC Act from underwater noise.	**EPS 53** to **EPS 88**, **EPS 111**to **EPS 137**, **EPS 143** to **EPS 144**, **EPS 160**
EPO 6	Seismic acquisition is undertaken in a manner such that any pygmy blue whales may continue to utilise the area without injury and are not displaced from a foraging area.	**EPS 53** to **EPS 88**, **EPS 111**to **EPS 125**, **EPS 128** to **EPS 130**, **EPS 132** to **EPS 133**, **EPS 136** to **EPS 139**, **EPS 143** to **EPS 152**, **EPS 161** to **EPS 162**
EPO 7	Seismic acquisition is undertaken in a manner such that any southern right whale may continue to utilise the area without injury or significant behavioural impacts.	**EPS 53** to **EPS 88**, **EPS 111**to **EPS 127**, **EPS 130**, **EPS 132** to **EPS 133**, **EPS 135** to **EPS 137**, **EPS 140** to **EPS 144**, **EPS 153** to **EPS 159**
EPO 8	Seismic acquisition is undertaken in a manner that preserves the sustainability status of the relevant fishery, as any impacts to stock, spawning or fishing activities will be minor, recoverable and short-term.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 93, **EPS** 96 to **EPS** 108, **EPS** 116, **EPS** 131
EPO 9	Seismic acquisition is undertaken in a manner that prevents any increased cost encumbrance or loss of income to commercial fishing license holders.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 93, **EPS** 96 to **EPS** 108, **EPS** 116**, EPS** 131
EPO 10	Seismic acquisition is undertaken in a manner that does not compromise the objectives of relevant recovery plans or wildlife conservation plans/advice that are in force for a marine fauna species.	**EPS 53** to **EPS 88**, **EPS 111** to **EPS 132**, **EPS 137** to **EPS 162**
EPO 11	Seismic acquisition is undertaken in a manner that does not compromise the ecosystem function or integrity of Commonwealth marine areas.	**EPS 53** to **EPS 88**, **EPS 111**to **EPS 132**, **EPS 137**, **EPS 143** to **EPS 162**
EPO 12	Seismic acquisition is undertaken in a manner that does not compromise the ecosystem function or integrity of AMPs or conservation status of native species within the AMPs.	**EPS 53** to **EPS 88**, **EPS 111** to **EPS 132**, **EPS 137** to **EPS 162**
EPO 13	Seismic acquisition is undertaken in a manner that prevents widespread (>100s of m from the acoustic source) and long term (>1 week to recover) impacts to plankton communities.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 88, **EPS** 96
EPO 14	Seismic acquisition is undertaken in a manner that prevents any detectable impacts to habitat forming primary producers, such as coral.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 88, **EPS** 96
EPO 15	Seismic acquisition is undertaken in a manner that prevents lethal injury or mortality to crustaceans and bivalves at rates beyond the natural range of variation.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 88, **EPS** 96
EPO 16	Seismic acquisition is undertaken in a manner that prevents any health impacts to divers or underwater recreational activities due to underwater seismic emissions.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 93, **EPS** 96, **EPS** 109 to **EPS** 110
EPO 17	Seismic acquisition is undertaken in a manner such that it does not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted to carry out exploration activities.	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 96
EPO 18	Seismic acquisition is undertaken in a manner that prevents any damage to UXOs or defence activities	**EPS** 53 to **EPS** 54, **EPS** 85 to **EPS** 88, **EPS** 163 to **EPS** 164

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 53**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 54: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Adherence to Policy Statement 2.1 requirements, through the implementation of the following control measures with respect to all whales (baleen and toothed), throughout the entire OA for the duration of the Otway Basin 3D MC MSS: • Observation Zone[AC]: 5+ km horizontal radius from the acoustic source; • Shut-down Zone[AC]: 2 km horizontal radius from the acoustic source; • Crew training: Crew are trained in the basic requirements of Policy Statement 2.1 prior to the survey commencement • Pre-start-up Visual Observations (daylight hours): 30 minutes prior to the commencement of Soft-start Procedure; • Soft-start Procedure: Commences only when no whales have been sighted within the relevant Shut-down Zone over a 30 minute Pre-start up Visual Observation period; • Start-up Delay Procedures: Will be implemented if a whale enters the Shut-down Zone during the Soft-start Procedures; • Stop Work Procedures: Will be implemented whenever a whale is detected in the relevant Shut-down Zone; • Night-time and Low Visibility Procedures: Will be implemented throughout periods of low visibility, including night-time, under rough seas or fog; • Compliance and sighting reports.	**EPS 55**: Operations will comply with Policy Statement 2.1. Part A requirements at all times, to mitigate potential impacts to whales.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 56: During daylight hours at least one MFO will be on duty at all times from the Seismic Vessel and one MFO will be on duty at all times from the Attending Support Vessel to undertake continuous visual observations for marine mammals[AC.]	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 57: MFOs will implement a 5+ km Observation Zone[AC] from the acoustic source.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 58: During daylight hours, Pre Start-up Visual Observations for the presence of whales within the 5+ km Observation Zone will be undertaken for at least 30 minutes before the commencement of the Soft Start Procedure	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 59: If no whales have been sighted within the relevant Shut-down Zones, Soft-start Procedures will commence over a 30-minute period;	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 60: A 2 km Shut-down Zone[AC] for all whales will be implemented throughout the entire OA at all times. On this basis a Low Power Zone is unnecessary	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 61: A start-up Delay will occur if a whale enters or is detected in the relevant Shut-down Zone during Soft-start Procedures. Whale presence within the Shut-down Zone will trigger an immediate and complete shut-down, and Soft-start Procedures may only resume after the whale has been observed to move outside the relevant Shut-down Zone, or when 30 minutes have lapsed since the last whale sighting	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 62: If a whale is detected within any nominated observation zone during the Otway Basin 3D MC MSS, an additional MFO will be stationed on the bridge of the vessel from which the detection was made to assist with observations. The only permissible exception to this is when the off-duty MFO is on a meal or toilet break or is standing-down having reached maximum shift duration for that particular working day. In these instances, a trained crew member will assist with marine mammal observation	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 63: Stop Work Procedures will be implemented for the entire duration in which operations are underway as follows: the acoustic source will shut-down whenever a whale is detected in the relevant Shut-down Zone. Soft-start Procedures may only resume after the whale has been observed to move outside the relevant Shut-down Zone, or when 30 minutes has lapsed snice the last whale sighting	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 64: Low visibility or night-time operations may occur provided that there have not been three or more whale instigated power-down or shut-down situations during the preceding 24-hour period	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
	EPS 65: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of these procedures.	Vessel Master SEA CSR MFO
Policy Statement 2.1: Precaution Zones: • Observation Zone[AC]: 5+ km horizontal radius from the acoustic source; • Shut-down Zone[AC]: 2 km horizontal radius from the acoustic source for 'other whales'; • An Extended Observation Zone for BW/PBW and SRW to a minimum of 7 km. • An Extended 7 km Shut-down Zone[AC] for BW/PBW and SRW; and • Shut-down at any distance for a SRW mother-calf pair.	**EPS 66**: The following Precaution Zones will be implemented throughout the duration of the Otway Basin 3D MC MSS: • Observation Zone – 5+ km horizontal radius from the acoustic source using the Seismic Vessel as the observation platform; • Extended Observation Zone for BW/PBW and SRW such that vessel based MFOs observe for BW/PBWs and SRWs as far as practicable, and to a minimum of 7 km during daylight hours. • Extended 7 km Shut-down Zone[AC] for BW/PBW and SRWs; • Extended 2 km Shut-down Zone[AC] for all 'other whales'.	MFO daily and weekly logs confirm the Precaution Zones were implemented.	SEA MFOs Party Chief CSR
	EPS 67: The acoustic source will be shut-down at any distance for a SRW mother-calf pair detection.	MFO daily and weekly logs confirm the Precaution Zones were implemented and shut downs occurred in the presence of a SRW mother-calf pair.	SEA MFOs Party Chief CSR
	EPS 68: MFOs and PAM operators onboard will have the primary responsibility for whale observation and compliance of the Precautionary Zones.	MFO and PAM daily and weekly logs confirm the Precaution Zones were implemented.	SEA MFOs CSR
Policy Statement 2.1: A.2 – Crew training (General crew).	**EPS 69**: All vessel crew will be trained to understand the basic requirements of Policy Statement 2.1 and the specific Precaution Zones that will be implemented as part of the Otway Basin 3D MC MSS.	Induction records outline the content of vessel inductions and crew present. A copy of these records will be kept onboard the Seismic Vessel and the CSR will also have a copy.	CSR SEA Vessel crew
	EPS 70: Vessel crews, MFOs and PAM Operators will be briefed on the EP controls and EP reporting requirements.	Induction records outline the content of vessel inductions and crew present. A copy of these records will be kept onboard the Seismic Vessel and the CSR will also have a copy.	CSR SEA Vessel crew
	EPS 71: Trained crew will act in a supporting role to the MFO by immediately reporting any opportunistic marine mammal sighting (from either the Seismic Vessel or any of the support vessels) to the on-duty MFO and assisting with MM observations as requested by the on-duty MFO.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. Bridge logs record opportunistic sightings by trained crew and confirms they were reported to the MFO. MFO daily and weekly logs record opportunistic sightings by trained crew.	CSR SEA Vessel crew

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 72: MFOs and PAM Operators will be inducted in their responsibilities regarding environmental matters (including Policy Statement 2.1 and all additional management procedures specific to the Otway Basin 3D MC MSS), whale identification, and the environmental legal obligations for companies operating in Australian waters.	Induction records outline the content of MFOs and PAM Operator inductions and personnel present.	CSR SEA MFO PAM Operators
	EPS 73: Reference material will be available onboard all vessels, with available materials Policy Statement 2.1, the Department's whale and dolphin sighting report form, and the APPEA CD Guide Search Australian Whales and Dolphins, and a copy of this EP.	Audit/inspection records verify the presence of reference materials on board the vessel.	CSR SEA
	EPS 74: Appropriate visual aids such as binoculars will be available on board the vessel to aid in the identification and reporting of any whales sighted.	Audit/inspection records verify the presence of suitable visual ais on board the vessel.	CSR SEA
Policy Statement 2.1: A.3.1 – Pre-start-up visual observations procedures. The 5+ km Observation Zone^{AC} will be monitored for the presence of whales for at least 30 minutes before the commencement of a Soft-start Procedures.	**EPS 75**: During daylight hours, visual observations for the presence of whales will be undertaken by the on-duty MFO onboard the Seismic Vessel in the 5+ km Observation Zone^{AC} for at least 30 minutes before the commencement of Soft-start Procedures.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFO daily and weekly logs confirm Pre-start-up procedures were implemented.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: A.3.2 – Soft-start procedures. Limits on when soft start procedures can commence will be applied for the duration of the survey as follows: • If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone^{AC}; • If acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.	**EPS 76**: Soft start procedures throughout the OA can only proceed under the following circumstances: • If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone^{AC}; • If acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFO daily and weekly logs confirm soft-start procedures were implemented.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: A.3.3 – Start-up delay procedures (if a whale is detected in any relevant Shut-down Zone during pre-start observations or during the soft start procedure).	**EPS 77**: If a whale is sighted within any Observation Zone during Soft-start Procedures, an additional MFO will be brought to the bridge of the vessel from which the detection was made to assist with observations. The only permissible exception to this is when the off-duty MFO is on a meal or toilet break or is standing down having reached maximum shift duration for that particular working day. In these instances, a trained crew member will assist with marine mammal observations.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFO daily and weekly logs confirm start-up delay procedures were implemented.	SEA MFOs Vessel Master CSR
	EPS 78: If any 'other whale' is sighted within or about to enter the 2 km Extended Shut-down Zone^{AC}, the acoustic source will shut-down completely. A Soft-start Procedure will resume only after the whale has been observed to move outside the 2 km Extended Shut-down Zone^{AC}, or when 30 minutes has lapsed since the whale was last sighted.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. Bridge logs. MFO daily and weekly logs confirm start-up delay procedures were implemented.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 79: If a BW/PBW or SRW is sighted within or about to enter the 7 km Extended Shut-down Zone during soft-start procedures, the acoustic source will shut-down immediately and soft start procedures may only resume once the BW/PBW or SRW is observed to move outside this Shut-down Zone or when 30 minutes have lapsed since the last BW/PBW or SRW sighting.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. Bridge logs. MFO daily and weekly logs confirm start-up delay procedures were implemented.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: A.3.5 – Stop Work Procedures. Stop work procedures will be implemented when: • Any 'other whale' enters or is detected in the Extended 2 km Shut-down Zone[AC;] • A BW/PBW enters or is detected in the Extended 7 km Shut-down Zone[AC]; • A SRW enters or is detected in the Extended 7 km Shut-down Zone[AC]; or • MFOs onboard the Seismic Vessel or the attending support vessel detect a SRW mother-calf pair at any distance.	**EPS 80**: If a whale is detected within any Observation Zone during daylight hours, an additional MFO will be stationed on the bridge of the vessel from which the detection was made to assist with observations. The only permissible exception to this is when the off-duty MFO is on a meal or toilet break or is standing-down having reached maximum shift duration for that particular working day. In these instances, a trained crew member will assist with marine mammal observations.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFO daily and weekly logs confirm stop work delay procedures were implemented.	MFOs SEA CSR
	EPS 81: Policy Statement 2.1: A.3.5 – Once full power operations are underway, the following Stop Work Procedures and additional controls will be applied: • If a BW/PBW is detected within the 7 km Extended Shut-down Zone[AC] the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 32 km away from the last PBW sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone. • If a SRW is detected within the 7 km Extended Shut-down Zone[AC] the acoustic source will be immediately shut-down and the seismic vessel will relocate to another area at least 11 km away from the last SRW (unaccompanied) sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. Note that this distance increases to 42 km if a calf is present. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone. • If an 'other whale' is detected within/about to enter the 2 km Extended Shut-down Zone[AC], the acoustic source will be shut-down immediately. • If a SRW mother-calf pair is observed from the Seismic Vessel or Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFOs daily and weekly logs confirm stop work delay procedures were implemented.	MFOs SEA CSR Vessel Master

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 82: Power-up of the acoustic source during the resumption of operations will only occur as follows: • For 'other whales' – when the individual whale/s have been observed to more outside the relevant Shut-down Zone, or when 30 minutes has lapsed since the last sighting. Power-up will follow the Soft-start Procedure. • For BW/PBW – once the seismic vessel has relocated to another area at least 32 km away from the last PBW sighting and Pre Start-up Visual Observations and Soft Start Procedures have occurred. Noting that if relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone. • For SRW - once the seismic vessel has relocated to another area at least 11 km away (for unaccompanied whales) or 42 km away (for mother-calf pairs) from the last SRW sighting and Pre Start-up Visual Observations and Soft Start Procedures have occurred. Noting that if relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFOs daily and weekly logs confirm stop work delay procedures were implemented.	MFOs SEA CSR Vessel Master
Policy Statement 2.1: A.3.6 – Night-time and low visibility procedures. During these periods, operations may proceed provided there have not been three or more whale instigated shut-downs during the preceding 24-hour period. Commencement of soft-start procedures at night or during periods of low visibility will be limited to circumstances when: • Acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period; and • may only occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer[AC]. • Additional criteria relating to BW/PBW or SRW shut-downs must also be satisfied before night time and low visibility operations can occur as described later in this table.	**EPS 83**: Low visibility or night-time operations may occur provided: • there have not been three or more whale instigated shut-downs during the preceding 24-hour period. In addition, commencement of soft-start procedures at night or during periods of low visibility will be limited to circumstances when: • Acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period; and • may only occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer[AC].	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure. MFO and PAM daily and weekly logs confirm night-time and low visibility procedures were implemented.	MFOs SEA CSR Vessel Master
Policy Statement 2.1: A.4 – Compliance and Sighting Reports. All cetacean sightings will be recorded in the 'Cetacean Sightings Application' software.	**EPS 84**: Whale sightings will be reported in accordance with Policy Statement 2.1 Part A.4 Compliance and Sighting Reports requirements, including submission of a report to the DoEE within two months of the survey completion.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4. Whale Observation Report confirms compliance.	MFOs SEA CSR
The minimum source size to acquire the survey data and meet the geophysical objectives of the Otway Basin 3D MC MSS has been selected. The acoustic source size used will not exceed that which has been modelled (3,480 in^3) and for which the predicted impacts and risks have been assessed. If the source used for the Otway Basin 3D MC MSS differs to that modelled in the EP, additional modelling will be undertaken.	**EPS 85**: The acoustic source will have a maximum source output no greater than 3,000 in^3, with a maximum zero to peak SPL of 256.3 dB re 1 µPa @ 1 m. Care will be taken to ensure spare acoustic sources are not discharged as part of the active source array.	MFOs will record source volumes as part of their daily observations each swing. MFOs daily and weekly logs confirm compliance.	Party Chief Vessel Master Survey Environmental Advisor MFOs TGS QC and HSE Representative
	EPS 86: If the source used for Otway Basin 3D MC MSS differs to that modelled within Welch *et al.* (2023), additional modelling will be undertaken, and the control measures and EPSs reviewed as appropriate to confirm they continue to manage impacts to ALARP and Acceptable Levels. Changes will be documented as per the Management of Change requirements.	MFOs will record source volumes as part of their daily observations each swing. MFOs daily and weekly logs confirm compliance. Documentation of modelling report and review of control measures/EPSs as per the Management of Change requirements.	EA

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The acoustic source will only be deployed and retrieved within the bounds of the OA.	**EPS 87:** The acoustic source will be retrieved and brought onboard the Seismic Vessel when not required, and will only be permitted to be in the water when in the bounds of the OA. The acoustic source will not be deployed or retrieved when outside the boundaries of the OA.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 show no breach in operations. Bridge logs. MFOs daily and weekly logs confirm compliance.	Vessel Master SEA MFOs CSR Seismic Operations Technicians
	EPS 88: Shape files will be loaded onto the survey vessels' navigation system outlining the areas within which the acoustic source may be activated, against the boundary extents of the OA and AA.	Exclusion polygons on survey vessel's navigation system.	Vessel Master SEA CSR Party Chief
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	**EPS 89**: Pre-survey consultation with relevant persons, confirming the Otway Basin 3D MC MSS will proceed, no less than four weeks before operations commence.	Documentation of consultation and consultation log demonstrate compliance.	EA TGS VOM
	EPS 90: Onshore personnel (EA) will communicate any updates determined through the continuing consultation process to the Vessel Master, where they have the potential to impact the Otway Basin 3D MC MSS and/or relevant persons.	Documentation of consultation and consultation log demonstrate compliance. Forms part of continuing consultation strategy.	EA Vessel Master
	EPS 91: Relevant persons will be notified following the conclusion of the survey as per the following Post-Activity Notifications: • All relevant persons – relevant time post completion; • AMSA – relevant time post completion; • NOPSEMA – 10 days post completion advising the completion of the Seismic Survey; and • NOPSEMA – As soon as practicable advising that all of the activities and obligations covered under the EP have been completed.	Documentation of consultation and consultation log demonstrate compliance.	EA TGS VOM
	EPS 92: A 48-hour 'look-ahead plan' will be provided to relevant persons (who register for the service) identified throughout the relevant persons consultation process, detailing the survey activities over the next 48 hours. The 48-hour look-ahead plans will be updated and issued every 24 hours and distributed to relevant persons via email.	Documentation of consultation, consultation log and issuing of weekly and 48-hour look-ahead plans demonstrate compliance. Forms part of continuing consultation strategy.	TGS VOM EA CSR Vessel Master
Publication of a Notice to Mariners of survey presence and towed array, no less than four weeks before operations commence.	**EPS 93**: A Notice to Mariners will be published and distributed by the AHO under the Navigation Act 2012, informing other marine users of the Seismic Survey, no less than four weeks before operations commence.	Record of Notice to Mariners.	EA TGS VOM
Where the potential for concurrent MSSs to occur is identified, TGS will engage with proponents prior to commencing the Otway Basin 3D MC MSS and develop a SIMOPS plan. SIMOPS planning will include the implementation of a 40 km spatial separation between the acoustic source and any other operating acoustic source in the Otway Basin area.	**EPS 94**: The NOPSEMA database of activity status and summaries has been searched to identify the potential for temporal and spatial overlap with other MSSs in the Otway Basin, in the development of this EP and will be searched immediately prior to the survey commencing for completeness.	Search of the NOPSEMA activity status and summaries website, looking in particular for EP submissions or decisions in the surrounding areas to the OA is completed and documented within the EP. This will be completed, again, immediately prior the survey and documented within SIMOPS plan.	EA TGS VOM
	EPS 95: A SIMOPS plan is developed and implemented where concurrent MSSs are identified to occur.	SIMOPS Plan documents the following: • Communications protocols • Work programming • Hazard management • Emergency Response Bridge logs confirm implementation and compliance.	EA Vessel Master SEA CSR
	EPS 96: TGS will maintain at least 40 km separation distance with any concurrent MSS at all times to avoid cumulative impacts to marine fauna.	Vessel track records as well as AIS track records demonstrate compliance. Communication records between the title holders and survey vessels.	Vessel Master SEA CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Compensation to fishers and vessel crews (i.e., the claimant) is demonstrated to have occurred for the following circumstances: • Interaction resulting in loss or damage to fishing equipment; • A temporary loss of fish landed catch due to damaged or lost fishing equipment; • Where displacement from fishing grounds results in additional costs incurred due to relocating; or • A temporary reduction in fish landed catch due to the effects of acoustic emissions or displacement from fishing grounds. Claims received from fishers in any circumstances other than those outlined above will not be assessed. Claims will be considered provided the interaction/displacement/loss of catch took place in the Adjustment Area (plus any additional area of avoidance requested around the survey vessels and towed equipment.) where the Otway Basin 3D MC MSS took place, and within the project active time frame only.	**EPS 97**: A Commercial Fisheries Compensation Protocol is in place for the Otway Basin 3D MC MSS.	Documentation of consultation demonstrates Fisheries Compensation Protocol for the Otway Basin 3D MC MSS is in place for the Seismic Survey	TGS VOM EA
	EPS 98: Pre-survey consultation with commercial fishers known to utilise the OA, notifying them in writing of the Commercial Fisheries Compensation Protocol in place for the Otway Basin 3D MC MSS, no less than 28 days before operations commence. Notification will be via SETFIA, TSIC, SIV, or AFMA (as relevant to each fishery) and will be provided in the form of a map, showing the OA and associated Adjustment Area, plus digital files in formats such as shapefiles and a copy of the Protocol in full.	Documentation of consultation demonstrates the Commercial Fisheries Compensation Protocol is in place for the Otway Basin 3D MC MSS and was provided to commercial fishers known to utilise the OA no less than 28 days before operations commence. Information provided is demonstrated to include a copy of the Protocol in full, a map showing the OA and Adjustment Area, plus digital files in formats such as shapefiles.	TGS VOM EA
	EPS 99: Eligible Commercial Fishes have been provided application forms and contact point relevant to commercial fishers relating to lodging a claim or notification regarding loss of catch, displacement, or fishing gear loss of damage.	Documentation of consultation demonstrates Attachment A of the Commercial Fisheries Compensation Protocol was attached to the pre-survey consultation with commercial fishers known to utilise the OA, and that contact point has been provided to commercial fishers.	TGS VOM EA
	EPS 100: Subject to a claim being lodged, a suitably experienced/qualified independent person/organisation will be engaged as the assessor of the claim, in consultation with the claimant. Suitably experienced and qualified is defined as a person or organisation with proven demonstrated experience in data analysis and data auditing processes and procedures within the industry.	Documentation of consultation with claimant around engagement of independent assessor, appropriate experience/qualifications of independent assessor, and agreements in place between TGS and independent assessor to engage their services for assessing the claim.	TGS VOM EA
	EPS 101: TGS will provide the assessor with a letter of instruction/project brief, which is to also be provided to the claimant as part of the assessment report.	Documentation of communications with assessor and claimant including provision of letter of instruction/project brief.	TGS VOM EA
	EPS 102: All compensation claims made by commercial fishing license holders or vessel crews for equipment damage/loss, displacement and loss of catch will be assessed for merit in accordance with the processes outlined in the Commercial Fisheries Compensation, within 30 days of receiving the claim.	Records demonstrate that claims made by commercial fishery license holders and vessel crew were assessed in accordance with the processes outlined in the Commercial Fisheries Compensation Protocol.	TGS VOM EA
	EPS 103: Where a commercial fishing licence holder has been involved in an interaction leading to loss or damage to the licence holder's equipment or displacement from usual fishing grounds, all interactions between the commercial fishing licence holder and the survey vessels will be recorded by the MSS operator. Details to be recorded should include, but not be limited to: the time, date and location coordinates of where the gear interaction occurred or the fishing was aborted and where it recommended, the name of the vessel, the licence holder number on the fishing gear, and any details of communications between the commercial fishing licence holder and the vessel/s.	Records demonstrate documentation of interactions with commercial fishing licence holder leading to loss or damage of the licence holder's equipment or displacement from usual fishing grounds.	Vessel Master
	EPS 104: Where possible and safe to do so, the Vessel Master shall make attempts to recover any fishing equipment. Photos will be provided to TGS by the Vessel Master.	Records demonstrate attempts to retrieved fishing equipment and photos of retrieved equipment.	Vessel Master.
	EPS 105: The independent assessor is to provide TGS with an assessment report which is to include the following information: - A copy of the letter of instruction/project brief; - Confirmation (or otherwise) that the information provided in the claim is sufficient to conduct a meaningful assessment; - A summary of the claim details (survey, applicant, vessel, month/s);	Records demonstrate receipt of assessment report and consultation with claimant.	TGS VOM EA

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	- For a loss of catch claim, monthly CPUE assessments as outlined in the Commercial Fisheries Compensation Protocol, including an estimation of any loss of catch and its market price; and - Any other information, comments, or views relevant to the assessment that the assessor may wish to include. Upon receiving and considering the assessment report, TGS will provide a copy of the report to the claimant and offer to meet with the claimant to discuss/address the claim.		
	EPS 106: All claimants will be notified of the outcome of the claim (or request clarification/additional information from the claimant) as soon as practicable and within 30 days after receiving the application, in accordance with the Commercial Fisheries Compensation Protocol.	Records demonstrate claimants were notified of the outcome of the claim or request for clarification/additional information, within 30 days of receiving the claim, in accordance with the Commercial Fisheries Compensation Protocol.	TGS VOM EA
	EPS 107: All claimants considered to have a claim of merit will receive compensation, in accordance with the Commercial Fisheries Compensation Protocol within 60 days of the claim determination. Claimants will be contacted via the email addressed provided within the claim application, unless requested otherwise. Compensation value paid will calculated based on the measures provided in the Commercial Fisheries Compensation Protocol.	Records demonstrate all claimants considered to have a claim of merit received compensation in accordance with the Commercial Fisheries Compensation Protocol, within 60 days of the claim determination.	TGS VOM EA
	EPS 108: In the event that a claimant disagrees with a claim assessment outcome, and an agreement cannot be reached between TGS and the claimant, the claimant may, within 30 days, opt to request that a suitably experienced/qualified independent third-party is engaged to review and determine the outcome of the claim. The appointment of the independent third party will be agreed mutually between TGS and the claimant. The dispute will be resolved within 60 days of dispute received by TGS, with the costs of engaging the independent third-party assessor covered by TGS.	Records demonstrate that a claimant's dispute has been assessed by a suitable experience/qualified independent third-party, where requested, and that costs of engaging the independent third-party assessor have been covered by TGS. Records document outcome of the independent third-party assessor's assessment and that the dispute has been resolved within 60 days of receipt of the dispute.	TGS VOM EA
Notification to recreational and commercial divers that are undertaking diving activities within 45 km of the acoustic source.	**EPS 109**: A Notification of MSS commencement will be provided to diving operators undertaking any diving activities within 45 km of the acoustic source, no less than four weeks before operations commence.	Documentation of consultation, consultation log demonstrates compliance.	EA SEA CSR
A joint risk assessment will be conducted with recreational and commercial divers where their respective diving activities may occur within 30 km of the acoustic source.	**EPS 110**: Where diving and seismic activities occur within 30 km of each other, a joint risk assessment between TGS and the proponent undertaking diving activities will be conducted prior to either operator commencing activity.	Documentation of consultation, consultation log demonstrates compliance. Records confirm a joint risk assessment has been developed, where diving and seismic activities occur within 30 km of each other. Bridge logs confirm implementation and compliance	EA Vessel Master SEA CSR
A 100 m precautionary Shut-down Zone from the operating source will be applied to marine turtles. The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within the 100 m Shut-down Zone. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting.	**EPS 111**: The acoustic source will be shut-down, or start-up will be delayed for 15 minutes if a marine turtle is observed within 100 m of the acoustic source. Operation of the acoustic source using soft-starts may only resume when the turtle has been observed to move outside the 100 m Shut-down Zone, or when 15 minutes have lapsed since the last turtle sighting	MFOs daily and weekly logs confirm marine turtle procedures were implemented.	MFOs SEA CSR Vessel Master
Policy Statement 2.1: Part B.1 – Marine Mammal Observers.	**EPS 112**: Marine mammal observations made during the Otway Basin 3D MC MSS will be undertaken by dedicated, trained and experienced MFO. All MFOs must: • Have proven 'at sea' experience in whale identification and behaviour, and distance estimation; and	Procurement process for engaging MFOs includes the provision of compliant CVs. Induction records outline qualifications/training of each MFOs.	TGS VOM SEA MFOs

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The use of suitably trained, dedicated and experienced MFOs to undertake visual observations for whales and ensure that the appropriate mitigation measures outlined in this EP are implemented. MFOs onboard survey vessels to maintain vigilance for SBT while conducting watches for other marine fauna.	• Be confident in the identification of those species that the EP predicts will be present in the OA; and • Hold a JNCC Marine Mammal Observer certification (or equivalent).		
	EPS 113: The lead MFO on the Seismic Vessel must have logged a minimum of 20 weeks' relevant sea-time engaged in marine seismic survey operations in Australian waters as an MFO.	Procurement process for engaging MFOs includes the provision of compliant CVs. Induction records outline qualifications/training of each MFOs.	TGS VOM SEA MFOs
	EPS 114: A minimum of two dedicated, trained, and experienced MFOs will be onboard the Seismic Vessel at all times, with at least one MFO on the bridge of the Seismic Vessel during daylight hours for the visual detection of marine mammals.	Induction records outline qualifications/training of each MFOs. MFOs daily and weekly logs confirm two MFOs were on board the Seismic Vessel to complete daylight visual observations.	TGS VOM SEA MFOs
	EPS 115: Two dedicated, trained, and experienced MFOs will be onboard the Attending Support Vessel at all times, with at least one MFOs on the bridge of the Attending Support Vessel during daylight hours for the visual detection of marine mammals.	MFOs daily and weekly logs confirm two MFOs were on board the Attending Support Vessel to complete daylight visual observations.	TGS VOM SEA MFOs
	EPS 116: MFOs onboard survey vessels are to maintain vigilance for SBT while conducting watches for other marine fauna. Sightings will be reported to ASBTIA within 24-hours of the observation being made.	MFOs daily and weekly logs document any SBT sightings Documentation of consultation, consultation log demonstrates compliance with notification of SBT sightings to ASBTIA.	MFOs SEA CSR Vessel Master EA
Policy Statement 2.1: Part B.2 – Night-time/Poor Visibility. During these periods, operations may proceed provided there have not been three or more whale instigated power-down or shut-downs during the preceding 24-hour period; or no BW/PBW or SRW shut-downs in the preceding 24 hours within 32 km and 42 km (respectively) of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).	**EPS 117**: Poor Visibility or night-time operations may occur provided that: • that there have not been three or more whale instigated power-down or shut-down situations during the preceding 24-hour period; and • that no BW/PBW shut downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); and • that no SRW shut downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).	MFOs daily and weekly logs confirm night time and poor visibility procedures were implemented	SEA MFO PAM Operator Vessel Master CSR
A PAM System will run 24-hours per day on the Seismic Vessel during the Otway Basin 3D MC MSS, with dedicated, trained, and experienced PAM Operators conducting acoustic monitoring for the presence of cetaceans while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedures. At least two dedicated, trained, and experienced PAM Operators will be on the Seismic Vessel for the duration of the Otway Basin 3D MC MSS, with at least one PAM Operator maintaining acoustic watch at all times while the acoustic source is active and during the 30 minutes prior to the commencement of any Soft Start Procedure.	**EPS 118**: PAM will be implemented on the Seismic Vessel and will operate 24-hours per day for the duration of the Otway Basin 3D MC MSS while the acoustic source is in the water and during the 30 minutes before the commencement of any Soft-start Procedure.	PAM daily and weekly logs confirm PAM is operational while the acoustic source is in the water and at least one PAM Operator maintains 'acoustic watch' at all times.	TGS VOM SEA PAM Operator Vessel Master CSR
	EPS 119: Two trained and experienced PAM Operators will be on board the Seismic Vessel for the duration of the Otway Basin 3D MC MSS. At least one PAM Operator will maintain 'acoustic watch' at all times while the acoustic source is in the water and during the 30 minutes before the commencement of any Soft-start Procedure.	Induction records outline qualifications/training of each PAM Operator. PAM daily and weekly logs confirm two PAM Operators were on board the Seismic Vessel, with at least one PAM Operator maintaining 'acoustic watch' at all times.	TGS VOM SEA PAM Operator Vessel Master CSR
	EPS 120: All PAM Operators will need to be able to demonstrate competency in the acoustic identification of the species that are likely to be present during the Otway Basin 3D MC MSS, and in interpreting acoustic software and estimating distance to any detected whale calls.	Procurement process for engaging PAM Operators includes the provision of compliant CVs. Induction records outline qualifications/training of each PAM Operator.	TGS VOM SEA PAM Operator Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 121: The lead PAM Operator must have logged a minimum of 20 weeks' relevant sea-time engaged in seismic survey operations in Australian waters as a PAM Operator.	Procurement process for engaging PAM Operators includes the provision of compliant CVs. Induction records outline qualifications/training of each PAM Operator.	TGS VOM SEA PAM Operator Vessel Master CSR
	EPS 122: The PAM system will be programmed to receive/recognise vocalisations of whales within the frequencies 10 Hz to 200 kHz. The frequency range will theoretically be tuned to detect both low frequency vocalisations of baleen whales and the high frequency echolocations of sperm whales.	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 verify the implementation of this procedure.	SEA PAM Operator Vessel Master CSR
	EPS 123: PAMGuard software will be incorporated into the PAM system to assist with locating and classifying the vocalisations of marine mammals, and the PAM operators will be suitably trained in using the PAMGuard software.	Procurement process for engaging PAM Operators includes the provision of compliant CVs. Induction records outline qualifications/training of each PAM Operator. PAM daily and weekly logs confirm PAMGuard software is operational an implemented.	SEA PAM Operator Vessel Master CSR
	EPS 124: A full replacement PAM system will be kept onboard the Seismic Vessel and will be used as a back-up if the PAM system malfunctions and is unable to be repaired.	Audit/inspection records verify the presence of a replacement PAM system	SEA CSR TSG VOM Vessel Master
	EPS 125: In the event that the PAM system malfunctions or becomes damaged, seismic operations may continue for 20 minutes without PAM while the PAM Operator diagnoses the issue. If it is found that the PAM system needs to be repaired or replaced, seismic operations may continue for an additional two hours without operational PAM as long as the following conditions are met: • It is during daylight hours and the sea state is less than or equal to Beaufort 4; • No whales were detected solely by PAM in the relevant mitigation zones in the previous two hours; • Two MFOs maintain watch at all times during seismic operations when PAM is not operational; and • Seismic operations with an active source, but without an active PAM system, do not exceed a cumulative total of four hours in any 24-hour period.	PAM daily and weekly logs confirm compliance	SEA PAM Operator Vessel Master CSR
Policy Statement 2.1: B.3 – Use of spotter aircraft and vessels to detect presence of cetaceans. Observers conducting periodic aerial surveys will also record any sightings of SBT aggregations.	**EPS 126**: Aerial surveys will be flown, if possible, within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer during April and October. Effort will concentrate on the area of the SRW Ag BIA and buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations and will also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. If the requirement for aerial surveys cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.	Flight logs document flight details and confirm compliance MFO and PAM logs confirm no low visibility or night-time operations within BIA until aerial surveys can occur.	SEA PAM Operator Vessel Master CSR
	EPS 127: Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs.	Flight logs document flight details and confirm compliance	SEA PAM Operator Vessel Master CSR
	EPS 128: Aerial surveys will be flown, if possible, within the seven days prior to commencement of any acquisition in the BW BIAs/buffer. Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.	Flight logs document flight details and confirm compliance MFO and PAM logs confirm no low visibility or night-time operations within BIA until aerial surveys can occur.	SEA PAM Operator Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 129: Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW.	Flight logs document flight details and confirm compliance	SEA PAM Operator Vessel Master CSR
	EPS 130: Aerial surveys will be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW and BW/PBW from the air.	Procurement process for engaging observers includes the provision of compliant CVs. Induction records outline qualifications/training of each observer.	SEA MFOs Vessel Master CSR
	EPS 131: Observers conducting aerial surveys will record sightings of SBT aggregations. Sightings will be reported to ASBTIA within 24-hours of the observation being made.	Flight logs document SBT sightings. Documentation of consultation, consultation log demonstrates compliance with notification of SBT sightings to ASBTIA.	MFOs SEA CSR Vessel Master EA
Policy Statement 2.1: B.4 – Increased Precaution Zones. The Shut-down Zone will be extended to 7 km from the acoustic source for BW/PBW and SRW and 2 km from the acoustic source for all 'other whales'. In addition, if a SRW mother-calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut down. When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.	**EPS 132**:A 5+ km Observation Zone[AC] will be applied for the full duration of the Otway Basin 3D MC MSS. MFOs will be required to scan as far as possible towards the horizon given the prevailing sightings conditions. In those circumstances when monitoring of the Observation Zone is a pre-requisite to certain operations, the minimum radius permissible will be 5 km.	MFOs daily and weekly logs confirm that Extended Precaution Zones were implemented, if required.	SEA MFOs Vessel Master CSR
	EPS 133: An Extended 7 km Shut-down Zone[AC] will be applied for the full duration of the Otway Basin 3D MC MSS for BW/PBW and SRW.	MFOs daily and weekly logs confirm that Extended Precaution Zones were implemented, if required.	SEA MFOs Vessel Master CSR
	EPS 134: An Extended 2 km Shut-down Zone[AC] will be applied for the full duration of the Otway Basin 3D MC MSS for 'other whales'.	MFOs daily and weekly logs confirm that Extended Precaution Zones were implemented, if required.	SEA MFOs Vessel Master CSR
	EPS 135: If a SRW mother-calf pair is observed from the Seismic Vessel or Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.	MFOs daily and weekly logs confirm that Extended Precaution Zones were implemented, if required.	SEA MFOs Vessel Master CSR
	EPS 136: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.	MFOs daily and weekly logs confirm that Extended Precaution Zones for blue whales/pygmy blue whales were implemented if required and where species identification was uncertain.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: B.6 Adaptive Management Measures: all whales. If there have been three or more whale instigated power-down or shut-down situations during the preceding 24-hour period, then low visibility or night-time operations must not occur.	**EPS 137**: Poor Visibility or night-time operations may occur provided that: • That there have not been three or more whale instigated power-down or shut-down situations during the preceding 24-hour period; and • That no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility); and	MFOs daily and weekly logs confirm that Adaptive Management Measure for all whales were implemented, if required.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	• That no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility.		
Policy Statement 2.1: B.6 Adaptive Management Measures: blue whales/pygmy blue whales Adaptive management controls will be implemented if higher than anticipated numbers of BW/PBWs are observed (three or more BW/PBW instigated shut-downs are made during the preceding 48 hour period).	**EPS 138**: If three or more BW/PBW instigated shut-downs are made during the preceding 48-hour period at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply: • Acquisition in the BW BIAs/buffer must cease; • Low Visibility or Night-time Operations must cease; and; • Normal operations may only resume after 24 hours of no BW/PBW instigated shut downs.	MFOs daily and weekly logs confirm that Adaptive Management Measures for BW/PBW were implemented if required.	SEA MFOs Vessel Master CSR
	EPS 139: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.	MFOs daily and weekly logs confirm that Adaptive Management Measures for BW/PBW were implemented if required and where species identification was uncertain.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: B.6 Adaptive Management Measures: southern right whales Adaptive management controls will be implemented for SRW in the following circumstances: • If higher than anticipated numbers of SRWs are observed (three or more SRW instigated shut-downs are made during the preceding 48 hour period); or • If a SRW mother-calf pair is observed from the Seismic Vessel or the Attending Support Vessel.	**EPS 140**: If three or more SRW instigated shut-downs are made during the preceding 48-hour period at any time or location during the Otway Basin 3D MC MSS, the following adaptive management controls will apply: • Acquisition in the SRW Aggregation BIA/buffer must cease; • Low Visibility or Night-time Operations must cease; • The acoustic source will be shut-down and the Seismic Vessel will relocate to another area at least 42 km away from the last SRW sighting, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone; and • Normal operations may only resume after 24 hours of no SRW instigated shut downs.	MFOs daily and weekly logs confirm that Adaptive Management Measures for SRW were implemented if required.	SEA MFOs Vessel Master CSR
	EPS 141: If a SRW mother and calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.	MFOs daily and weekly logs confirm that Adaptive Management Measures for SRW were implemented if required.	SEA MFOs Vessel Master CSR
	EPS 142: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.	MFOs daily and weekly logs confirm that Adaptive Management Measures for SRW were implemented if required and where species identification was uncertain.	SEA MFOs Vessel Master CSR
Policy Statement 2.1: B.6 Adaptive Management Measures: other whales Adaptive management controls will be implemented for other whales in the following circumstances: • If higher than anticipated numbers of other whales are observed (three or more instigated shut downs are made during the preceding 24 hour period); or • If an 'other whale' mother-calf pair is observed within 12 km of the active acoustic source.	**EPS 143**: If three or more 'other whale' instigated shut-downs occur within a 24-hour period, the Seismic Vessel will relocate at least 12 km in the direction away from the sightings before commencing Pre Start-up Visual Observations and Soft Start Procedures	MFOs daily and weekly logs confirm that Adaptive Management Measures for 'other whales' were implemented if required.	SEA MFOs Vessel Master CSR
	EPS 144: If an 'other whale' mother and calf pair is observed within 12 km of the active acoustic source during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut down and the Seismic Vessel will relocate to another area at least 12 km away from the last recorded position of the mother-calf pair before commencing Pre Start-up Visual Observations and Soft Start Procedures.	MFOs daily and weekly logs confirm that Adaptive Management Measures for 'other whales' were implemented if required.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Additional Management Measures – Blue Whales/Pygmy Blue Whales to allow Biologically Important Behaviours to Continue: • No operation of the acoustic source within 16 km of any BW/PBW BIAs during the period January to June (inclusive) which represents the peak foraging season during which BW/PBW are expected to consistently be present at foraging areas in and around the OA at elevated densities. The only exception allowed relates to the acquisition of the 2D tie line. • Implementation of an Extended 7 km Shut-down Zone[AC]; • Additional MFO observation effort (including aerial surveys); and • Implementation of adaptive management measures.	**EPS 145**: A 16 km buffer will be established around all BW BIAs where they overlap or approach the OA. The Seismic Vessel will not activate the acoustic source(s) within any BW BIAs/buffer from January to June (inclusive). The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **EPS 162 - 163.**	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 146: During the 'foraging shoulder season' months of September to December and July the seismic vessel is permitted to operate in the BW BIAs/buffer in accordance with the following protocols: • All reasonable efforts will be made to ensure that aerial surveys will be conducted to assist with the detection of BW/PBW in the BW BIAs/buffer during the 'foraging shoulder season'. Within the seven days prior to commencement of any acquisition in the BW BIAs/buffer aerial surveys will be flown, if possible, to identify any BW/PBWs that may be present. Any such detections will result in acquisition within the BW BIAs/buffers being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of BW/PBWs in the BW BIAs/buffer by relocating to parts of the BW BIAs/buffer where potential impacts on BW/PBWs are less likely. • If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met. • Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW and to redirect seismic survey efforts in order to avoid BW/PBW that are present. • Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of BW/PBW from the air.	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 147: Start-up (via soft start) can only commence in the BW BIAs/buffer during the 'foraging shoulder season' if the following criteria are met: • A minimum of two hours of daylight remain before nightfall; • Good sightings conditions prevail that allow visual observations of the Extended Observation Zone; • MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no BW/PBW have been sighted; and • The start-up location does not occur within 32 km of an area where a BW/PBW detection has been made in the last four days.	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 148: Low Visibility or Night-time Operations may occur provided that no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 149: A 7 km Extended Shut-down Zone for BW/PBW will be implemented throughout the entire OA (including the BW BIAs/buffer).	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 150: If a BW/PBW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut down and the seismic vessel will relocate to another area at least 32 km away from the last PBW sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone.	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 151: A Start-up Delay will occur if a BW/PBW enters or is detected in the 7 km Extended Shut-down Zone during the soft start, and soft start procedures may only resume once the BW/PBW is observed to move outside this Shut-down Zone or when 30 minutes have lapsed since the last BW/PBW sighting.	MFOs daily and weekly logs confirm that Additional Management Measures for BW/PBW were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 152: Shape files will be loaded onto the survey vessels' navigation system outlining the BW BIAs and 16 km buffer, against the boundary extents of the OA and AA.	Exclusion polygons on survey vessel's navigation system.	SEA MFOs Vessel Master CSR
Additional Management Measures – Southern Right Whales to allow Biologically Important Behaviours to Continue: • No operation of the acoustic source within 42 km of the SRW Aggregation BIA during the core aggregation months of May to September; • Implementation of an Extended 7 km Shut-down Zone[AC]; • Additional MFO observation effort (including aerial surveys); and • Implementation of adaptive management measures.	**EPS 153**: A 42 km buffer will be established around the SRW Ag BIA where it approaches the OA. The Seismic Vessel will not activate the acoustic source(s) within the SRW Ag BIA/buffer from May to September (inclusive)	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 154: During April and October (shoulder aggregation months) the Seismic Vessel is permitted to operate in the SRW Ag BIA/buffer in accordance with the following protocols: • All reasonable efforts will be made to ensure aerial surveys will be conducted to assist with the detection of SRWs in the SRW Ag BIA/buffer during April and October. Within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer, aerial surveys will be flown, if possible, to identify any SRW that may be present. Any such detections will result in acquisition within the SRW Ag BIA/buffer being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of SRWs in the SRW Ag BIA/buffer by relocating to parts of the OA where potential impacts on SRWs are less likely. • If the requirement for aerial surveys as outlined above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met • Aerial survey efforts will concentrate on the area of the SRW Ag BIA/buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Aerial surveys should also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. • Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs and to redirect seismic survey efforts in order to avoid areas where SRWs are present. • Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW from the air.	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 155: Start-up (via soft start) can only commence in the SRW Ag BIA/buffer during April and October if the following criteria are met: • A minimum of two hours of daylight remain before nightfall; • Good sightings conditions prevail that allow visual observations of the Extended Observation Zone; • A Support Vessel is available to undertake the requisite marine mammal monitoring;	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	• MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no SRWs have been sighted; and • The start-up location does not occur within 42 km of an area identified by aerial surveys as an area where a SRW mother-calf detection has been made in the last four days.		
	EPS 156: Low Visibility or Night-time Operations may occur provided the no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility.	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 157: A 7 km Extended Shut-down Zone for SRWs will be implemented throughout the entire OA (including the SRW Ag BIA/buffer). If a SRW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut down and the seismic vessel will relocate to another area at least 11 km away from the last SRW (unaccompanied) sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. Note that this distance increases to 42 km if a calf is present as described in **EPS 67**.	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 158: A Start-up Delay will occur if a SRW enters or is detected in the 7 km Extended Shut-down Zone during soft start, and soft start procedures may only resume once the SRW is observed to move outside this Shut-down Zone or 30 minutes have lapsed since the last SRW sighting.	MFOs daily and weekly logs confirm that Additional Management Measures for SRWs were implemented when required.	SEA MFOs Vessel Master CSR
	EPS 159: Shape files will be loaded onto the survey vessels' navigation system outlining the SRW Aggregation BIA and 42 km buffer, against the boundary extents of the OA and AA.	Exclusion polygons on survey vessel's navigation system.	SEA MFOs Vessel Master CSR
Additional Management Measures – other whales: A 2 km Extended Shutdown Zone[AC] for 'other whales' will be implemented throughout the entire OA at all times. On this basis a low power zone is deemed unnecessary. Soft starts at night and during periods of low visibility will also be limited in accordance with EPS 83[AC]	**EPS 160**: A 2 km Extended Shut-down Zone for 'other whales' will be implemented throughout the entire OA at all times.	MFOs daily and weekly logs confirm the Additional Management Measure for 'other whales' was implemented.	SEA MFOs Vessel Master CSR
Additional Management Measures –2D tie Line acquisition inside any BIA/buffer: 2D tie line acquisition inside any BIA/buffer (the BW BIAs/buffer and the SRW Ag BIA) will only be permitted to occur in accordance with EPS 162 - 163.	**EPS 161**: 2D tie line acquisition inside any BIA/buffer will only be permitted to occur: • In daylight hours, and • Two MFOs must be on duty on the Seismic Vessel and • Two MFOs must be on-duty on the Attending Support Vessel.	MFOs daily and weekly logs confirm the Additional Management Measure for 2D tie line acquisition inside the BW BIAs/buffer and the SRW Ag BIA was implemented.	SEA MFOs Vessel Master CSR
	EPS 162: 2D tie line acquisition inside any BIA/buffer can occur at any time providing the following criteria are met: • An aerial survey has been conducted within 4 days of such operations commencing and no baleen whales have been detected. This aerial survey must focus on the area of planned acquisition that overlaps the BIA/buffer and must extend to at least 42 km on either side of the planned 2D sail line; • 2D tie line acquisition inside any BIA/buffer must not occur for more than 12 hours total within any 24 hour period; • The Extended Observation Zone as described in BMP 4 is implemented; and	MFOs daily and weekly logs confirm the Additional Management Measure for 2D tie line acquisition inside the BW BIAs/buffer and the SRW Ag BIA was implemented.	SEA MFOs Vessel Master CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	• The acoustic source must not be active for more than a combined total of 20 hours (maximum) in the BIAs/buffers.		
No operation of the acoustic source within the UXO SDC006 Acoustic Exclusion Area.	**EPS 163:** No operation of the acoustic source within the UXO SDC006 Acoustic Exclusion Area throughout the duration of the Otway Basin 3D MC MSS.	MFOs daily and weekly logs confirm that the acoustic source was not discharged within the UXO Acoustic Exclusion Area.	SEA MFOs Vessel Master CSR
	EPS 164: Shape files will be loaded onto the survey vessels' navigation system outlining areas the extent of the UXO SDC006 Acoustic Exclusion Area within which the acoustic source cannot be activated.	Exclusion polygons on survey vessels' navigation system.	Vessel Master Party Chief SEA CSR

7.2.8 Acoustic Disturbance Impact and Risk Summary

Based on the findings of this EP, with the implementation of the control measures, underwater noise emitted from the acoustic source during the Otway Basin 3D MC MSS is considered to have (at most) a **Moderate** residual risk to the identified receptors (i.e. environmental and other marine users). Consequences of predicted effects will generally be minor and short-term with regards to displacement of marine mammals and fish away from the acoustic source.

The suite of control measures determined to be adopted have been developed in accordance with industry best practice and relevant legislation. In accordance with the Risk Ranking Descriptions in **Table 34**, where risk cannot be reduced to '**Low**', additional control measures must be evaluated to determine whether the risk is reduced to **ALARP**.

Additional controls have also been evaluated to determine whether they are effective and practicable to implement in **Table 42**. Where they are determined to effectively reduce the environmental impact and risk, and are practicable to implement, they have been adopted. Consequently, it is considered that the environmental impacts and risks on the identified receptors arising from the acoustic disturbance to the marine environment arising from the Otway Basin 3D MC MSS, are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4,** the suite of control measures, are considered appropriate to manage the impacts arising from the acoustic disturbance to the marine environment on all receptors, specifically marine fauna, commercial fishers, and divers to an **Acceptable Level.**

7.3 Routine Permissible Waste Discharges

7.3.1 Description of Source of the Impact and Risk

The source of routine permissible waste discharges falls into three categories:

- Biodegradable waste (sewage, greywater and galley waste such as putrescible food waste);
- Deck drainage; and
- Bilge water.

The primary forms of biodegradable wastes produced during the Otway Basin 3D MC MSS are sewage, greywater and galley wastes, with these wastes originating from processes such as ablution, laundry, and galley activities. A typical Seismic Vessel is likely to have a maximum daily sewage discharge capacity of approximately 15 m^3, and the typical discharge capacity for the support vessel/s is approximately 4.2 m^3. The actual daily volumes of sewage and greywater generated during the Otway Basin 3D MC MSS will be directly related to the number of personnel onboard (0.45 m^3 of sewage/greywater per day[40] (NERA, 2018)). Putrescible waste discharges are in the order of 1 – 2 kg per person per day (NERA, 2018).

The composition of sewage, putrescible wastes and grey water may include (NERA, 2018):

- Physical particulate matter such as solids composed of floating, settleable, colloidal and dissolved matter;
- Chemicals including nutrients, organics, and inorganics; and
- Biological pathogens (e.g. bacteria, viruses, protozoa, parasites, etc.).

The other source of permissible waste discharges are deck drainage and bilge water. Ongoing cleaning and maintenance operations around the vessels, as well as deck drainage from rain or spray will generate deck waters which may contain remnants of spilt materials, detergents, oils and smaller solid materials (garbage). Larger chemical spills would be contained and/or cleaned up prior to entering the deck drainage systems as per the vessels emergency spill/pollution plans. Bilge water is drainage water and other fluids captured in a closed system, often from engine or machinery spaces within the vessel, for treatment prior to discharge at sea, or stored for discharge at port – as per requirements of MARPOL Annex 1. The contaminant profile of bilge water may comprise cleaning chemicals, hydrocarbons and heavy metals.

[40] This volume has been taken as a worst-case from the NERA '*Planned discharge of sewage, putrescible waste and grey water*' Environment Plan Reference Case which estimates the total volume generated to range from 0.04 – 0.45 m^3 per person per day. The worst case of 0.45 m^3 has been used for these calculations.

Dilution of discharges from moving vessels, such as will be the case for the Otway Basin 3D MC MSS, occurs immediately. Moving ships displace a volume of water that is immediately refilled as the ship passes, resulting in mixing within the wake astern of the ship. A ship with a large cross-sectional area (draft and width) will create more mixing than a smaller ship (Loehr *et al*., 2006). Vigorous mixing occurs in the turbulent wake and extends horizontally beyond the beam (or width) and vertically below the draft (or depth) of the vessel (Loehr *et al*., 2006). Loehr *et al*. (2006) describe simple equations to conservatively describe the dilution factors for wastewater discharges from moving large and small cruise ships. Based on these equations, dilution factors for an effluent discharge of 62 m^3/day are estimated to be > 1,000,000. NERA (2018) states that a 150 m^3 discharge of sewage and greywater from a fixed-point discharge will be at background levels within 500 m from the point of discharge. A combined maximum discharge of 62 m^3/day is estimated for the seismic vessels, therefore it is anticipated that background levels will be observed considerably closer than 500 m and likely within 200 – 300 m of the discharges.

Non-biodegradable wastes, such as garbage, will also be generated during routine operations onboard the seismic vessels. The discharge to sea of all types of garbage is prohibited under MARPOL Annex V unless explicitly permitted under the Annex. Garbage onboard the survey vessels such as plastics, synthetic ropes, cooking oils, paper and cardboards, rags, packaging materials, polystyrenes/foam and wood are prohibited from being discharged into the marine environment, and these materials will be retained onboard the vessels and stored for later disposal onshore at suitable waste facilities.

7.3.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 88.**

Table 88 Environmental Receptors Assessed

Receptor	Section reference
Marine Environmental Quality	**Section 7.3.2**
Plankton	
Benthic Habitats	
Benthic Invertebrates	
Non-listed Marine Fauna	
Listed Marine Fauna	

Any marine receptor that resides in the water column and which could uptake contaminants through a dissolved, particulate, or dietary exposure pathway may be affected by discharges. Impacts from discharges may include (NERA, 2018):

- Ecosystem health values being compromised in the vicinity of the waste discharge;
  - Eutrophication and associated changes in the abundance and biomass of biota (e.g. enhanced growth of phytoplankton in the water column), change in patterns of biological diversity (reduced species diversity with shifts towards fewer well adapted species), and/or increased biological and chemical oxygen demand; and
  - Direct and indirect toxicity to marine flora and fauna (including acute lethal and/or chronic sub-lethal effects) for example through exposure to chemicals used to treat wastewater and waste systems.

- Primary industry values may be impacted, for example, seafood caught within the immediate vicinity of the discharge may not be safe for human consumption; and
- Recreation and aesthetic values may be affected such as contamination of water with human pathogens making swimming areas unsuitable.

The level of impact is directly related to the volume of the contaminant, the volume of the receiving water body, its toxicity, the sensitivity of the receiving environment, and the types of organisms present. Permissible discharges can affect organisms across all trophic levels but are likely to have immediate effects on primary producers, such as phytoplankton, which in turn influence higher trophic levels. Initial impacts are most likely to affect organisms within the water column due to the depths in which the vessels will be operating. The shallowest depths (approximately 200 m) occur along the eastern margins of the OA. It is unlikely that the benthic organisms at these depths (and greater) will be affected by any discharges occurring from the survey vessels.

The main environmental impacts associated with the discharge of routine permissible wastes are localised increase in nutrients, (particularly phosphorus and nitrogen) which can trigger excessive algal growth leading to the eutrophication of waters (Perić, 2016; Wilewska-Bien *et al.*, 2016). Excessive algal growth can lead to algal blooms. The resultant decomposition of organic bloom material by bacteria in the water column can lower the oxygen concentration of waters, particularly in low flow environments, leading to anoxic conditions. When algal blooms die and settle to the sea floor the organic material is decomposed by bacteria on the seabed, excessive amounts can lead to anoxic conditions within the marine sediments.

Plankton communities have developed to rapidly respond to favourable conditions such as an influx of nutrients, as often occurs in areas of natural upwelling of nutrients, such as the Bonney Coast upwelling, located just to the north and north-west of the OA. In areas of seasonal upwelling of nutrients, once the favourable conditions cease, plankton populations collapse and/or return to previous conditions (NERA, 2018). Thus, an equilibrium exists between primary and secondary producers (Kämpf *et al*., 2023). Any potential change to phytoplankton or zooplankton abundance, due to the discharge of permissible wastes will be localised and short lived, returning to background conditions within tens to a few hundred meters of the discharge location (Parnell, 2003). Furthermore, the environment in which the vessels will be operating in is a high flow environment where dispersal and dilution of biodegradable waste will be maximised. Localised nutrient enrichment is therefore minimised. Primary productivity in the South-east AMPs is predominately derived from oceanic sources and is strongly influenced by climatic and oceanographic factors and is therefore considered relatively resilient to human impact (NOO, 2001). Nutrients are generally concentrated at the shelf edge, with shallower coastal areas naturally more oligotrophic, and consequently more susceptible to degradation from excessive nutrient loading from terrestrial sources, arising from urban and intensive agriculture areas (NOO, 2001).

Shallow water environments, such as those encountered in the West Tasmania Canyons KEF along the eastern portion of the OA, are the environments most vulnerable to pollution arising from the discharge of waste products from shipping vessels. Deeper water environments, such as canyons and slope features, which predominate within the OA are more resilient due the depths and strong oceanic currents present which increase the assimilative capacity of the environment, thereby reducing any potential impacts. Deteriorating water quality has been identified as a threat to marine species, such as marine turtles, whales, dolphins, and seabirds identified within the OA (DNP, 2013). The EPBC Act Conservation Management Plans and Recovery Plans advise implementing measures to manage and reduce, where possible, waste generation to avoid adverse impacts on these species.

Cruise ships are identified as an emerging pressure in the South-east Marine Parks, where the region is used as a gateway to the Antarctic via Melbourne and Hobart (NOO, 2001). Cruise ships can accommodate from 1,000 to > 3,500 persons per ship. Marine pollution such as marine debris and the discharge of oils, chemicals or wastes, from commercial and recreational vessels has been identified as a pressure in South-east AMPs. Recreational and commercial boating are sources of waste that can have a direct physical impact on marine species. Discarded or lost nets and pots, nylon rope and polypropylene strapping bands can cause physical entanglement of fish, sea mammals and birds. Plastic and other debris can be ingested by birds and mammals. Microplastics are an emerging contaminant that can be ingested by fish and smaller organisms. Debris from boats can smother benthic fauna and act as a source of transfer of exotic organisms (NOO, 2001). There will be no discharge of marine debris from the vessels and every effort will be made to ensure no accidental loss of debris from the survey vessels (see **Section 8.5**).

Habitat modification and degradation has been identified as a threat to sensitive fish and mammal species. It is unlikely that any discharge of permissible waste discharges will lead to changes in benthic or pelagic habitats, that would adversely impact these species as the volumes of waste proposed to be discharged are well within the assimilative capacity of the receiving environment.

The discharge of food wastes can lead to increased scavenging behaviour around vessels by seabirds and fish, sometimes leading to animals following the vessel for significant distances. Albatross bird species are known to actively follow ships and boats. It is known that this is not an instinctive behaviour, but a learned behaviour as they have associated ships and boats with the presence of food, from fish on longlines and nets to kitchen scraps thrown overboard (Weimerskirch, 2023). Petrels and shearwaters are known to actively and aggressively pursue bait from long line fishing from commercial and recreational fishing boats (Friesen *et al*., 2017). Fatalities are mostly associated with entanglement in fishing hooks and lines, thus bird fatalities, as a result of following vessels in search of food scraps are highly unlikely.

Discharges from vessels are most problematic when they occur within enclosed inland waters and/or semi-enclosed coastal waters with minimal flushing (Koboevic *et al*., 2022), or within areas with high conservation values such as marine parks (Byrnes and Dunn, 2020). Receiving waters with high flushing capacities can dilute or eliminate most pollutants associated with waste discharges (Koboevic *et al*., 2022). The wind, waves and currents present in the offshore marine waters of the OA (**Section 4.3.3**) will ensure that any discharges are rapidly mixed. As a result of the highly dispersive environment within the OA, nutrients from the discharge of permissible waste will not accumulate or lead to eutrophication of waters surrounding the discharge point. As the majority (~ 90%) of the OA is within waters >1000 m, discharges are unlikely to settle on the seabed and affect benthic organisms.

The disposal of waste from normal operations of vessels is permitted within AMPs as long as the disposal is compliant with MARPOL requirements (DNP, 2013). There will be no discharge of routine permissible waste within the boundaries of the Nelson AMP and Zeehan AMP. All permissible discharges from the survey vessels will be compliant with the requirements of MARPOL. Therefore, there will be no impact on the sensitivities and values within the AMPs located within the OA, nor are any adverse impacts anticipated within the wider OA from routine permissible waste discharges from the survey vessels.

Based on the control measures that will be implemented during the Otway Basin 3D MC MSS for routine permissible waste discharges (**Section 7.3.4**), it is considered that the consequence of impact is *Negligible*, with a likelihood of seeing a measurable impact being *Unlikely* which results in an overall risk ranking of **Negligible**.

7.3.3 Decision Context

The decision context for routine permissible waste discharges has been assessed as Type A for all receptors, given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

7.3.4 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

A Hierarchy of Controls methodology (**Table 89**) has been used to assess control measures to determine the benefits in their use towards risk reduction. The control measures that will be implemented during the Otway Basin 3D MC MSS to manage the impacts from routine permissible waste discharges to **ALARP** are included in **Table 90**. The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 89 Hierarchy of Control Measures for Routine Permissible Waste Discharges

Eliminate	As discussed within **Table 90**, the vessels are required to be manned at all times which means the generation of sewage, greywater and galley waste cannot be eliminated. Alternatively, waste could be stored onboard the vessels and transported to onshore licensed facilities for disposal. This would add significant operational costs, time, and additional health and safety risks. Therefore, it was considered that elimination of permissible waste discharge was not practicable. TGS will eliminate the discharge of all routine permissible wastes within the boundaries of the Nelson AMP and Zeehan AMP to ensure there are no impacts to the sensitivities within these areas resulting from routine permissible waste discharges.
Substitute	Limited practicable substitutes for discharge of this waste are available.
Reduce	The impact from the discharge of routine permissible wastes will be reduced by the implementation of the adopted control measures, as described within **Table 90.** For example, the oil content within oily water discharge will be reduced to 15 ppm through an approved oily water separator; an approved comminuting and disinfecting system will be used to treat sewage; and a grinder/comminuter will be used where required to reduce the potential impacts from the discharge of food waste on the marine environment.
Mitigate	To mitigate the effects of routine permissible waste discharges, separation distances have been defined for sensitive receptors, in accordance with the legislative requirements and good industry practice. For example, no untreated sewage and putrescible wastes will be discharged within 12 NM from land and no treated sewage and putrescible wastes will be discharged within 3 NM from land to protect nearshore coastal margins from potential nutrient enrichment.

Table 90 Assessment of Control Measures for Routine Permissible Waste Discharges

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of routine permissible waste discharges.	Yes
All survey vessels will comply with the requirements of MARPOL Annex I (Regulations for the Prevention of Pollution by Oil), Marine Order 91 (Marine Pollution Prevention – Oil) and *Protection of the Sea* (Prevention of Pollution from Ships) *Act 1983,* including*:* In accordance with MARPOL Annex I and Marine Order 91, vessels ≥ 400 gross tonnes will: • Have an oil discharge monitoring and control system and oil filtering equipment on-board. • The oil discharge monitoring and control system will be maintained and operated to the 15 ppm standard. • Hold a current International Oil Pollution Prevention (**IOPP**) Certificate. • Maintain an oil usage management logbook. • Treated bilge water will only be discharged when the vessel is moving, and the oil discharge monitoring and control system and oil filtering equipment is operating. If oil discharge monitoring and control systems and oil filtering equipment is unavailable, bilge water mixtures will be retained onboard for onshore disposal.	P = Yes E = Effective	Vessels used for the survey that are of 400 GRT will have an oil discharge monitoring and control system and oil filtering equipment on board (with related IOPP Certificate) in accordance with the requirements of MARPOL Annex I and AMSA Marine Order 91. Bilge water discharges will be undertaken in accordance with the requirements of MARPOL Annex I and Marine Order 91 to ensure discharges to the marine environment are acceptable or otherwise retained on board for disposal. It is a legislative requirement to meet the relevant aspects of MARPOL Annex I, Marine Order 91 and the PSPPS Act.	Yes
All survey vessels will comply with the requirements of MARPOL Annex IV (Regulations for the Prevention of Pollution by Sewage from Ships) and Marine Order 96 (Marine Pollution Prevention – Sewage), including: • A valid international Sewage Pollution Prevention (**ISPP**) Certificate, as required by vessel class; • Sewage will only be discharged via an IMO-approved sewage treatment plant; or • Comminuted/disinfected sewage via an IMO-approved system will only be discharged when ≥3 nm from land and when the vessel is moving at ≥4 knots; or • Sewage that has not been comminuted/disinfected via an IMO-approved system will only be discharged when ≥12 nm from land and when the vessel is moving at ≥4 knots.	P = Yes E = Effective	Vessels used for the survey that are of 400 GRT or certified to carry more than 15 persons, will have an appropriate sewage treatment plant, sewage comminuting and disinfecting system or sewage holding tank on board (with related ISPP Certificate). Sewage discharges to the marine environment during the survey will be undertaken in accordance with the requirements of MARPOL Annex IV and Marine Order 96, including via approved systems and the required discharge rates to ensure adequate dispersion of discharges to reduce the potential for impacts. It is a legislative requirement to meet the relevant aspects of MARPOL Annex IV and Marine Order 96.	Yes
All survey vessels will comply with the requirements of MARPOL Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) and Marine Order 95 (Marine Pollution Prevention - Garbage), including: • Putrescible waste will be discharged while the vessel is moving and ≥12 nm from the nearest land; or • Putrescible waste will pass through a comminuter or grinder capable of passing through a screen with no opening wider than 25 mm in diameter prior to discharge and discharged while the vessel is moving and ≥3nm from the nearest land.	P = Yes E = Effective	Discharges of putrescible waste will be undertaken in accordance with the requirements of MARPOL Annex V and Marine Order 95. It is a legislative requirement to meet the relevant aspects of MARPOL Annex V and Marine Order 95.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Good Industry Practice			
Equipment/machinery involved in the treatment of wastes, such as oil discharge monitoring and control systems, oil filters and comminuters, will maintained and calibrated as per the manufacturers guidelines to ensure they operate effectively.	P = Yes E = Effective	Routine maintenance ensures that the requirements of MARPOL are able to be met. Records of equipment calibration can be retained and checked to confirm that equipment is operating as per the requirements of MARPOL and associated Marine Orders. Good industry practice; environmental benefit outweighs additional cost.	Yes
Equipment/machinery involved in the treatment of wastes will be operated by trained crew who will be instructed at the pre-mobilisation environmental induction on how to comply with the requirements of this EP.	P = Yes E = Effective	It is a standard industry practice to hold inductions for all onboard the vessels, with participation in induction meetings compulsory. During inductions, crew will be made aware of their responsibilities with regard to the management of routine permissible waste discharges to the marine environment. Good industry practice; environmental benefit outweighs additional cost.	Yes
The vessel crew will be made aware of their responsibilities with regard to the management of routine permissible waste discharges to the marine environment during the environmental induction.	P = Yes E = Effective	Environmental inductions are standard industry practice to ensure the health and safety of those onboard and the protection of the environment. During inductions, crew will be made aware of their responsibilities with regard to effects of the discharge of wastes to the marine environment and restrictions around the overboard discharge of waste materials. Participation in inductions is compulsory. Good industry practice; safety benefit outweighs additional cost.	Yes
All storage areas for hazardous substances will be designed and maintained to support some form of containment/bunding.	P = Yes E = Effective	Containment/bunding will be in place around all locations where hazardous substances/materials are stored onboard the vessels to capture any spilled substances/materials and prevent them from entering the marine environment. Good industry practice; environmental benefit outweighs additional cost.	Yes
Deck scupper plugs will be available beside all deck drainage points that lead overboard.	P = Yes E = Effective	Deck scupper plugs allow for drainage to be blocked off, stopping wastes (including hazardous wastes) from entering the marine environment through deck drainage systems. Good industry practice; environmental benefit outweighs additional cost.	Yes
Display of signage notifying vessel crew of disposal requirements.	P = Yes E = Effective	The display of signage notifying crew of disposal requirements is good industry practice and reminds crew of waste disposal requirements/separation etc. Good industry practice; environmental benefit outweighs additional cost.	Yes
Alternatives/Substitutes Controls Considered:			
Eliminate the discharge of sewage, greywater and galley waste to the marine environment through the retention of all liquid wastes on board and, ultimately, transfer to a licensed onshore disposal site.	P = No E = Very Effective	As the vessels is required to be manned, the generation of sewage, greywater and galley waste is unavoidable. Although this would reduce the impact of discharges, the storage of this waste on board the vessels and subsequent transfer to shore will require additional supply journeys to be made throughout the survey, adding significant operational costs (e.g., fuel) and also increasing the environmental and navigational impact and risk associated with the Otway Basin 3D MC MSS. Given the control measures to be adopted commit to the routine discharge of permissible wastes in accordance with MARPOL and associated Marine Orders, the environmental risks associated with this activity are considered low. On this basis, the cost associated with this control measure are considered disproportionate to the benefits gained.	No
Eliminate the discharge deck drainage and bilge water to the marine environment through the retention of all liquid wastes on board and, ultimately, transfer to a licensed onshore disposal site.	P = No E = Very Effective	Maintenance and cleaning required for the safe operation of survey vessels generate water requiring treatment and are unavoidable. Deck drainage arising from rain or spray cannot be eliminated. Although this would reduce the impact of discharges, the storage of this waste on board the vessels and subsequent transfer to shore will require additional supply journeys to be made throughout the survey, adding significant operational costs (e.g. fuel) and also increasing the environmental and navigational impact and risk associated with the Otway Basin 3D MC MSS. Given the control measures to be adopted commit to the routine discharge of permissible wastes in accordance with MARPOL and associated Marine Orders, the environmental risks associated with this activity are considered low. On this basis, the cost associated with this control measure are considered disproportionate to the benefits gained.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Additional Controls Considered			
There will be no planned discharge of routine permissible wastes within the boundaries of the Nelson AMP and Zeehan AMP.	P = Yes E = Effective	AMPs occupy approximately 17% of the OA. These areas are considered to be particularly sensitive and thus it is proposed that no planned discharge of routine permissible wastes within the boundaries will occur, in order to avoid any potential adverse effects within these areas. Routine permissible discharges are expected to be rapidly mixed and diluted by the wind, waves and currents which characterise the offshore marine waters of the OA, before dispersion occurs, and thus no adverse effects are anticipated. As a result of the highly dispersive environment within the OA, toxicants and nutrients from the discharge of sewage will not accumulate or lead to eutrophication of waters surrounding the discharge point or within nearby AMPs. Water quality is not a value cited within the South-east Commonwealth Marine Reserves Network Management Plan (DNP, 2013) for the Zeehan or Nelson AMPs. The disposal of waste from normal operations of vessels is permitted within AMPs as long as the disposal is compliant with MARPOL requirements (DNP, 2013). Although all discharges from the survey vessels will be compliant with the requirements of MARPOL and are not anticipated to cause any potential adverse effects, TGS has committed to not discharge routine permissible wastes within the boundaries of any AMP. Environmental benefits outweigh additional costs.	Yes
There will be no discharge of routine permissible wastes within the boundaries of any KEF.	P = No E = Limited Effectiveness	Part of the West Tasmania Canyons KEF overlaps the OA. This KEF occupies a total area of 289,850 km^2, with approximately 3,770 km^2 located within the OA, equating to approximately 7% of the OA. The bioregion marks a transitional area between deeper offshore waters and the southeast margin of the Australian mainland, with maximum depths of 5,645 m within the canyons. Canyons have steep or rugged topography that provide habitat for sessile invertebrates, such as corals, which in turn attract other organisms and higher order species. Canyons can intensify currents and the concentration of nutrients to enhance productivity and biodiversity. Plumes of sediment and nutrient-rich water can be seen at or near the heads of canyons. Any routine permissible discharges are expected to be rapidly mixed and diluted by the wind, waves and currents which characterise the offshore marine waters of the OA, before dispersion occurs. As a result of the highly dispersive environment within the OA, toxicants and nutrients from the discharge of sewage will not accumulate or lead to eutrophication of waters surrounding the discharge point and will be readily assimilated in the high productivity environment. Furthermore, the depths within the canyons make it highly unlikely that any pollutants will settle on the seafloor within the canyons. It is not considered practicable to limit routine permissible discharges within the boundaries of the West Tasmania Canyons KEF. Given no adverse effects on the sensitivities within the KEF are predicted, the cost to operations associated with storage of wastes or additional journeys to areas of the OA located outside of the KEF are considered grossly disproportionate to the limited environmental benefit gained from implementing the control measure.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Residual Risk Ranking**
Marine Environmental Quality	Negligible	Unlikely	Negligible
Plankton	Negligible	Unlikely	Negligible
Benthic Habitats	Negligible	Unlikely	Negligible
Benthic Invertebrates	Negligible	Unlikely	Negligible
Non-listed Marine Fauna	Negligible	Unlikely	Negligible
EPBC Act Listed Marine Fauna	Negligible	Unlikely	Negligible
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to be Negligible. TGS considers the adopted control measures are appropriate to manage the impacts of routine permissible waste discharges during the survey. The proposed control measures have been developed in accordance with the legislative requirements and good industry practice and taking into account the specific environmental, social, economic and cultural characteristics of the OA. No effective and practicable alternative or additional control measures were identified as part of the assessment process. Therefore, the predicted impacts to receptors from routine permissible waste discharges are reduced to **ALARP.**			

7.3.5 Impact and Risk Acceptability

Table 91 Demonstration of Impact and Risk Acceptability for Routine Permissible Waste Discharges

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The Residual Risk has been determined to be Negligible.
Ecologically Sustainable Development	The management of the impacts associated with the Otway Basin 3D MC MSS as a result of routine permissible waste discharges can be carried out in compliance with the five principles of ESD as defined within the EPBC Act. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS's Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	It is considered that the routine discharge of permissible wastes will not result in any significant impact on environmental values or sensitivities within the OA, including protected and non-protected species which inhabit the water column, such as pelagic fish, sharks, marine mammals, marine turtles and seabirds within the wider OA and also within the AMPs and KEFs located within the OA. Given the expected mixing and dispersion of discharged waste and the depths over which the vessels will be operating, it is unlikely that routine permissible waste discharges will impact upon benthic species. By extension, the discharge of routine permissible wastes is not expected to impact significantly on the environmental values and sensitivities, including significant benthic habitats and communities, which comprise the deep canyons of the West Tasmania KEF within the OA. No impacts to other marine users are predicted to occur as a result of the discharge of routine permissible wastes. It is considered that the proposed control measures provide appropriate protection to marine fauna and other marine users from the potential effects associated with the routine discharge of permissible waste. A number of control measures were considered as part of the assessment process, and it was concluded that the addition of any further control measures not already considered would provide little or no additional protection, or the costs would be grossly disproportionate to the benefit gained.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of routine permissible waste discharges has been determined to be Negligible and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. **Species Recovery Plans and Conservation Advices** Routine permissible waste discharges are not considered as a threat requiring additional management under the relevant Management Plans, Species Recovery Plans or Conservation Advices. **AMP Values, Management Prescriptions and IUCN Reserve Management Principles** As there will be no discharge of routine permissible wastes within the boundaries of the Nelson AMP and Zeehan AMP, routine permissible waste discharges are not expected to impact significantly on environmental values or sensitivities at a local or regional level. No population-level impacts or serious irreversible ecological implications are predicted to the values of AMPs. Management of routine permissible discharges during the Otway Basin 3D MC MSS will be in accordance with the MARPOL requirements. **Conservation values and objectives of the South-east Marine Parks Management Plan** Routine permissible waste discharges are not expected to impact significantly on environmental values or sensitivities of the SEMR at a local or regional level.
Social Acceptance – Relevant Person Expectations	Concerns were raised by relevant persons around the potential for rubbish to accumulate on beaches as a result of discharges from the Survey Vessels operating for the Otway Basin 3D MC MSS. TGS has committed to zero rubbish disposed at sea and with the strict control measures (in accordance with industry best practice) in place to ensure rubbish does not enter the marine environment, the risk of environmental impacts relating to waste discharges from Survey Vessels are considered to be at a socially **Acceptable Level.**
External Context – Commonwealth and State Legislative Criteria	TGS will ensure that routine permissible waste discharges (i.e. sewage, food waste, deck drainage and bilge water) will be undertaken in accordance with international conventions and relevant legislation, including: • MARPOL Annex I, Annex IV and Annex V; • Protection of the Sea (Prevention of Pollution from Ships) Act 1983; • Marine Order 91 (Marine Pollution Prevention – Oil), 2014; • Marine Order 95 (Marine Pollution Prevention – Garbage), 2013; and • Marine Order 96 (Marine Pollution Prevention – Sewage), 2013.
Industry Best Practice	The proposed control measures follow industry best practice and best practice guidelines, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations which provides guidance on waste management, including, but not limited to: • Vessels having a Waste or Garbage Management Plan to effectively manage waste in line with MARPOL regulations as well as local legislation;

Criteria for Acceptance	Acceptability Summary
	• Waste that cannot be incinerated will be segregated and stored for disposal ashore; • Prior to discharge, oily water is processed to remove oil to less than 15 ppm; • Greywater and sewage are dealt with according to MARPOL; and • The APPEA Code of Environmental Practice includes an objective to reduce the impact of routine waste discharges on the marine environment to **ALARP** and to an **Acceptable Level** by ensuring discharges are in accordance with legislative requirements and predicted levels.
ALARP	Total elimination of all impacts associated with routine permissible waste discharges cannot be achieved, as the generation of sewage, greywater and galley waste is unavoidable and will be discharged to sea daily in relatively small volumes, with no practicable alternatives. However, these discharges will be in accordance with the requirements of the MARPOL 73/78 Convention (as implemented in Commonwealth waters by the Protection of the Sea (Prevention of Pollution from Ships) Act 1983). Additionally, the survey vessels may have to discharge bilge water and deck drainage during the survey if required. There are no predicted long-term effects at a population level on any species identified in this EP, and no adverse effects on the environmental values of protected areas or KEFs as a result of routine permissible waste discharges are expected. Based on the discussions above, including the potential impacts on the environment and the associated control measures to be implemented, the residual risk from routine permissible waste discharges from the survey vessels is considered **Negligible** and to **ALARP**. Therefore, the impacts from this activity associated with the Otway Basin 3D MC MSS are considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' or above are considered acceptable if the requirements in **Table 51** can be demonstrated and if the level of residual impact and risk are determined to be Moderate or less. Based on the above evaluation, the potential impacts from routine permissible waste discharges meets the requirements of the impact and risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of routine permissible waste discharges on all identified receptors to an **Acceptable Level.**

7.3.6 Environmental Performance

Table 92 Environmental Performance Outcomes, Standards and Measurement Criteria for Routine Permissible Waste Discharges

Number	Environmental Performance Outcome	Environmental Performance Standard
EPO 19	No release of unplanned objects, emissions or discharges to sea or air	**EPS 165** to **EPS 185**
EPO 20	All routine permissible waste discharges will meet or exceed the requirements of MARPOL Annex I, IV, V and Marine Orders 91, 95 and 96	**EPS 165** to **EPS 185**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 165**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 166: The Seismic Survey will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
All survey vessels will comply with the requirements of MARPOL Annex I (Regulations for the Prevention of Pollution by Oil), Marine Order 91 (Marine Pollution Prevention – Oil) and *Protection of the Sea* (Prevention of Pollution from Ships) *Act 1983,* including*:* In accordance with MARPOL Annex I and Marine Order 91, vessels ≥ 400 gross tonnes will: • Have an oil discharge monitoring and control system and oil filtering equipment on-board. • The oil discharge monitoring and control system will be maintained and operated to the 15 ppm standard. • Hold a current IOPP Certificate. • Maintain and oil usage management logbook. • Treated bilge water will only be discharged when the vessel is moving and the oil discharge monitoring and control system and oil filtering equipment is operating. If oil discharge monitoring and control system and oil filtering equipment is unavailable, bilge water mixtures will be retained onboard for onshore disposal.	**EPS 167**: An IOPP Certificate will be held by every ship of 400 gross tonnage and above involved in the Otway Basin 3D MC MSS as per division 3 of Marine Order 91, and MARPOL Annex I.	A pre-mobilisation vessel audit and inspection confirms IOPP Certificate is valid.	TGS VOM VOC Vessel Master Party Chief
	EPS 168: Oil filtering equipment (of an approved design) processes oily water to meet the 15 ppm requirement of MARPOL Annex I, Marine Order 91 and the PSPPS Act. Any discharge of processed oily water will be undertaken while the vessel is underway in accordance with the above concentration requirements. Any separated oil will be retained/stored onboard and transported to shore for disposal at an approved facility.	Pre-mobilisation vessel audit and inspection confirms approved oil filtering equipment is onboard and equipment is operational. Discharge logs confirm that any discharges of processed oily water are compliant with MARPOL Annex I, Marine Order 91 and the PSPPS Act.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
All survey vessels will comply with the requirements of MARPOL Annex IV (Regulations for the Prevention of Pollution by Sewage from Ships) and Marine Order 96 (Marine Pollution Prevention – Sewage), including:	**EPS 169**: An ISPP Certificate will be held by every ship of 400 gross tonnage and above involved in the Otway Basin 3D MC MSS, and any vessel certified to carry more than 15 persons as per division 3 of Marine Order 96, and Regulation 4 of MARPOL Annex IV.	A pre-mobilisation vessel audit and inspection confirms ISPP Certificate is valid.	Vessel Master VOC Party Chief SEA

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
• A valid ISPP Certificate, as required by vessel class; • Sewage will only be discharged via an IMO-approved sewage treatment plant; or • Comminuted/disinfected sewage via an IMO-approved system will only be discharged when ≥3 NM from land and when the vessel is moving at ≥4 knots; or • Sewage that has not been comminuted/disinfected via an IMO-approved system will only be discharged when ≥12 NM from land and when the vessel is moving at ≥4 knots.	**EPS 170**: When sewage is comminuted and disinfected using an approved system (as per Marine Order 96), the discharge to sea will only occur at a moderate rate when the vessel is travelling at greater than 4 knots, and when further than 3 NM from the nearest land as per MARPOL Annex IV.	Pre-mobilisation vessel audit and inspection confirms approved sewage comminuter and disinfection system is onboard and equipment is operational. Discharge logs confirm that any discharges of processed sewage are compliant with MARPOL Annex IV and Marine Order 96.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
	EPS 171: When sewage is not comminuted or disinfected using an approved system, the discharge to sea will only occur at a moderate rate when the vessel is travelling at greater than 4 knots, and when further than 12 NM from the nearest land as per MARPOL Annex IV.	Discharge logs confirm that any discharges of unprocessed sewage are compliant with MARPOL Annex IV and Marine Order 96.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
	EPS 172: When operating vessels within 12 NM of the coast, any sewage that is not comminuted or disinfected through an approved system will be stored within holding tanks. This sewage will then either: be transferred ashore for appropriate treatment; or, discharged to sea once further than 12 NM from the coast as per the standards above.	Where they occur, discharge logs confirm that any discharges of processed sewage are compliant with MARPOL Annex IV and Marine Order 96. Where waste is stored for onshore disposal, Waste Transfer Certificate issued by licensed facility or carrier are obtained and records kept on file in accordance with record management procedures.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
All survey vessels will comply with the requirements of MARPOL Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) and Marine Order 95 (Marine Pollution Prevention - Garbage), including: • Putrescible waste will be discharged while the vessel is moving and ≥12 NM from the nearest land; or • Putrescible waste will pass through a comminuter or grinder capable of passing through a screen with no opening wider than 25 mm in diameter prior to discharge and discharged while the vessel is moving and ≥3 NM from the nearest land.	**EPS 173**: When food wastes have been comminuted or ground down to less than 25 mm, the discharge of this waste can occur when further than 3 NM from the nearest land as per MARPOL Annex V.	Pre-mobilisation vessel audit and inspection records confirm that macerator is onboard, functional and in use. Discharge logs confirm that any discharges of processed food wastes are compliant with MARPOL Annex V and Marine Order 95.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
	EPS 174: When food wastes have not been comminuted or ground down to less than 25 mm, the discharge of this waste can occur when further than 12 NM from the nearest land as per MARPOL Annex V.	Discharge logs confirm that any discharges of unprocessed food wastes are compliant with MARPOL Annex V and Marine Order 95.	Party Chief Chief Engineer Survey Vessel SEA CSR Vessel Master
	EPS 175: Any vessel used for the Seismic Survey over 100 gross tonnes or certified to carry 15 or more persons will hold and maintain a Garbage Management Plan for minimising, collecting, storing, processing and disposing of garbage, including the use of equipment on board, as per MARPOL Annex V and Marine Order 95.	A pre-mobilisation vessel audit and inspection confirms a valid Garbage Management Plan is in place, in accordance with MARPOL Annex V and Marine Order 95.	VOC Vessel Master Party Chief
	EPS 176: All permissible waste discharges will be recorded within the vessel's discharge log.	Discharge logs confirm that any planned discharges of processed and unprocessed oil, sewage and waste have been recorded.	Vessel Master Party Chief Chief Engineer Survey Vessel SEA CSR
Equipment/machinery involved in the treatment of wastes, such as oil discharge monitoring and control systems, oil filters and communiters, will be maintained and calibrated, as per the manufacturers guidelines, to ensure they operate effectively.	**EPS 177**: Equipment/machinery involved in the treatment of wastes, such as oil discharge monitoring and control systems, oil filters and communiters, will be maintained and calibrated, as per the manufacturers guidelines, to ensure they operate effectively.	Maintenance logs confirm appropriate maintenance. A pre-survey vessel audit and inspection confirms that equipment involved in the treatment of wastes has undergone appropriate maintenance.	Party Chief Chief Engineer Survey Vessel SEA CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Equipment/machinery involved in the treatment of wastes will be operated by trained crew who will be instructed at the pre-survey environmental induction on how to comply with the requirements of this EP.	**EPS 178**: Equipment/machinery involved in the treatment of wastes will be operated by trained crew who will be instructed at the pre-survey environmental induction on how to comply with the requirements of this EP.	Induction records show Environmental Induction includes instruction on the operation of waste treatment equipment/machinery and meeting the requirements of this EP. Induction records confirm vessel crew attended and Environmental Induction.	Party Chief SEA CSR Chief Engineer Survey Vessel Vessel Master Vessel Crew
The vessel crew will be made aware of their responsibilities with regard to the management of routine permissible waste discharges to the marine environment during the environmental induction.	**EPS 179**: The vessel crew will be made aware of their responsibilities with regard to the management of routine permissible waste discharges to the marine environment during the environmental induction.	Induction records show Environmental Induction includes instruction on the operation of waste treatment equipment/machinery and meeting the requirements of this EP. Induction records confirm vessel crew attended and Environmental Induction.	Party Chief SEA CSR Vessel Master Vessel Crew
All storage areas for hazardous substances will be designed and maintained to support some form of containment/bunding.	**EPS 180**: Hazardous materials (e.g., hydrocarbons and cleaning chemicals) storage areas will be fully contained/bunded.	A pre-mobilisation vessel audit and inspection confirms that hazardous materials storage areas are fully contained/bunded/	Party Chief SEA CSR Vessel Master
	EPS 181: Spill response kits will be stored nearby the storage location of hazardous substances to support effective clean-up if a spill does occur.	A pre-mobilisation vessel audit and inspection confirms the availability and location of spill response kits.	Party Chief SEA CSR Vessel Master
Deck scupper plugs will be available beside all deck drainage points that lead overboard.	**EPS 182**: Scupper plugs, or equivalent drainage control measures, will be readily available to allow drains to be blocked in the event of a hydrocarbon or cleaning chemicals spill to deck (i.e. outside bunded area).	A pre-mobilisation vessel audit and inspection confirms the availability and location of scupper plugs.	Party Chief SEA CSR Vessel Master
Display of signage notifying vessel crew of disposal requirements.	**EPS 183**: Display of signage notifying vessel crew of disposal requirements.	A pre-mobilisation vessel audit and inspection confirms signage consistent with the requirements of this EP has been developed.	Party Chief SEA CSR Vessel Master
There will be no planned discharge of routine permissible wastes within the boundaries of the Nelson AMP or Zeehan AMP.	**EPS 184**: Planned routine permissible discharges will not occur within the boundaries of the Nelson AMP and Zeehan AMP.	Discharge logs confirm that discharges have not occurred within the boundaries of Australian Marine Parks.	Party Chief SEA CSR Vessel Master
	EPS 185: Shape files will be loaded onto the survey vessels' navigation system outlining exclusion areas around the Nelson AMP and Zeehan AMP within which permissible wastes cannot be discharged.	Discharge logs confirm that discharges have occurred outside of the boundaries of the Nelson AMP and Zeehan AMP. Vessel track records. Exclusion polygons on survey vessel's navigation system.	SEA CSR Vessel Master

7.3.7 Routine Permissible Waste Discharge Impact and Risk Summary

Based on the assessment above, including the identification of potential impacts on the environment and the associated control measures to be implemented, the residual risk of routine permissible waste discharges during the Otway Basin 3D MC MSS is considered to be **Negligible**.

The suite of control measures to be implemented have been developed in accordance with Industry Best Practice and relevant legislation. Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from routine permissible waste discharges are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4**, the suite of control measures are considered appropriate to manage the risks and impacts arising from routine permissible waste discharges during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

7.4 Atmospheric Emissions

7.4.1 Description of Source of the Impact and Risk

The release of combustion of exhaust gases from mechanical equipment (engines, generators, winches, power-units, plant machinery etc.) and the incineration of wastes represent the main sources of potential atmospheric emissions during the Otway Basin 3D MC MSS. Most of these gaseous emissions will be in the form of carbon dioxide (**CO_2**) and carbon monoxide (**CO**); however, smaller quantities of other gases such as methane (**CH_4**), nitric oxide (**NO**), nitrogen dioxide (**NO_2**) and sulphur dioxide (**SO_2**) may be emitted particularly during any incomplete combustion. Fine particulate matter (**$PM_{2.5}$**) may also be emitted from the combustion of MDO (Nabi *et al*., 2012).

Vessels used during the Otway Basin 3D MC MSS may have Ozone Depleting Substances (**ODS**) onboard. However, if these ODSs are onboard the vessel, they will be within closed loop systems, such as rechargeable refrigeration systems, and will not be discharged deliberately.

7.4.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 93.**

Table 93 Environmental Receptors Assessed

Receptor	Section reference
Marine Environmental Quality	**Section 7.4.2**
Seabirds	

A reduction in ambient air quality is known to contribute to human health issues, such as pulmonary disease, cardiovascular disease and cancer (Steiner *et al*., 2016). Atmospheric emissions from the survey vessels, onboard equipment and incineration of wastes can cause a reduction in air quality in the localised area around the vessels, however, the emissions will be rapidly dispersed by strong winds that typify the area resulting in any localised pollution in the vicinity of the discharges being short lived. The open ocean nature of the OA and the variable, moderate wind conditions will ensure that emissions from the vessels will not impact on the onshore/nearshore interests/communities. Greenhouse gas emissions (CO_2 and CH_4) are linked to climate change.

The volume of the emissions associated with this Otway Basin 3D MC MSS will centre around the vessels and be relatively small in terms of the wider environment (which could be up to 32 m^3 per day of fuel usage as per **Section 3.5.4**). In addition, the constant movement of the vessels will ensure that the discharge is not occurring in a single location for any significant period of time.

Potential receptors therefore include seabirds and migratory shorebirds which may traverse the OA whilst foraging or on route between staging sites and foraging grounds, and humans in the immediate vicinity of the vessel during discharge events. Air pollution is not considered a substantial threat to seabird species, with avian species in close proximity to urban and industrial areas most at risk from poor air quality (Richards *et al*., 2021).

The main control measures (detailed below in **Section 7.4.4**) relate to the compliance with MARPOL Annex VI, and the use of MDO instead of Heavy Fuel Oil (**HFO**). It is considered that the consequence of this activity occurring is *Negligible*, with the likelihood of this consequence occurring being *Likely*. This results in a residual risk of **Negligible**.

7.4.3 Decision Context

The decision context for atmospheric emissions has been assessed as Type A for all receptors, given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

7.4.4 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

A Hierarchy of Controls methodology (**Table 94**) has been used to assess control measures to determine the benefits in their use towards risk reduction. The control measures that will be implemented during the Otway Basin 3D MC MSS to manage the impacts from atmospheric emissions to **ALARP** are included in **Table 95**. The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 94 Hierarchy of Control Measures for Atmospheric Emissions

Eliminate	Fuel use and its associated atmospheric emissions cannot be eliminated as fuel is a fundamental requirement for the operation of the survey vessels. Deliberate discharge of ODS will be eliminated during the Otway Basin 3D MC MSS as outlined in **Table 95**.
Substitute	As outlined within **Table 95**, the survey vessels will use MDO to power their engines, rather than other fuels such as HFO. Although the cost of using MDO is higher than that of HFO, the reduction in sulphur content is considered an important step in managing impacts to **ALARP**. No other alternative fuel sources are currently commercially viable for larger vessels.
Reduce	Similar to the discussion around substitution above, the use of MDO will reduce the contaminants discharged from the combustion engines on the vessels in order to meet the requirements of Marine Order 97, the PSPPS Act and MARPOL Annex VI.
Mitigate	The control measures within **Table 95** have been assessed to ensure that they mitigate the impacts from atmospheric emissions to **ALARP**. This is primarily done through the implementation of measures required under Marine Order 97, the PSPPS Act and MARPOL Annex VI.

Table 95 Assessment of Control Measures for Atmospheric Emissions

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All survey vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of atmospheric emissions.	Yes
Compliance with: MARPOL Annex VI (Regulations for the Prevention of Air Pollution from Ships). Protection of the Sea (Prevention of Pollution from Ships) Act 1983. Marine Order 97 (Air Pollution): • Vessels >400 tonnes require a certificate to demonstrate that they comply with the requirement to prevent unnecessary air pollution; • The vessel engines do not emit excess NOx emissions; • Incinerators used are of an approved standard and it is operated correctly; • Vessels must comply with a plan for energy efficiency and implement a Ship Energy Efficiency Management Plan (**SEEMP**); • Vessels shall not emit excess sulphur emissions; • Noxious and toxic substances shall not be emitted through combustion of illegal substances; and • ODS shall not be deliberately released.	P = Yes E = Effective	MARPOL is a legislative requirement for vessels operating in Australian Commonwealth waters and will be implemented by all vessels. Implementation of the regulations will reduce the atmospheric emissions released into the environment. It is a legislative requirement to meet the relevant aspects of MARPOL Annex VI, the PSPPS Act and Marine Order 97.	Yes
Good Industry Practice			
Vessels will use MDO grade fuel during the survey. The sulphur content of fuel oil used on board vessels for propulsion or operation will not exceed 0.50% m/m.	P = Yes E = Effective	The vessels associated with the Otway Basin 3D MC MSS will be utilising MDO grade fuel in order to reduce the pollutants from the combustion engines. As of 1 January 2020, the new limit for sulphur in fuel oil used on-board vessels is 0.50% m/m. MDO usually has less than 0.2% sulphur which aids in meeting the requirements of the legislation outlined in the control measure above. Good industry practice, environmental benefit outweighs additional cost.	Yes
Fuel consumption will be recorded and monitored for abnormal consumption, with corrective action taken if necessary.	P = Yes E = Effective	While fuel consumption throughout the Otway Basin 3D MC MSS is inevitable, abnormal consumption results in additional atmospheric emissions as well as additional costs. Good industry practice, environmental benefit outweighs additional cost.	Yes
All combustion and incineration machinery will be appropriately maintained as per the manufacturer's guidelines.	P = Yes E = Effective	Routine maintenance ensures that machinery is running in accordance with the manufacturer's specifications, reducing excess emissions. Good industry practice, environmental benefit outweighs additional cost.	Yes
Only wastes approved by the vessel's Garbage Management Plan will be incinerated and no oil or other noxious substances will be incinerated.	P = Yes E = Effective	Incineration of materials not approved by the Garbage Management Plan may lead to the release of toxic emissions and will not be compliant with MARPOL. Good industry practice, environmental benefit outweighs additional cost.	Yes
Incineration will only occur when the vessel is a distance greater than 12 NM from shore.	P = Yes E = Effective	Incineration of wastes beyond 12 NM from shore will not result in any emissions that will make their way to shore, nor will any emissions be visible from shore. Good industry practice, environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternatives/**Substitutes Controls Considered:**			
No incineration on vessels.	P = No E = Effective	Incineration of wastes on vessels is a standard industry practice and negates the need for additional visits from supply vessels to remove waste. The storage of wastes onboard the survey vessels have added risks to human health.	No
Use of alternative fuels to power vessels.	P = No E = Effective	Alternative fuel sources include solar, wind, and biofuels. Adopting renewable energy sources would incur considerable cost associated with vessel modifications. Such fuel sources have not been commercially proven for vessels and helicopters such as those that will be used during the Otway Basin 3D MC MSS.. Given the low-level of risk identified, this option is not considered commercially viable. Non-fuel powered engines are not considered technically efficient to execute.	No
Use of incinerators and engines with higher environmental efficiency.	P = No E = Effective	There are significant costs associated with modifying vessel equipment such as incinerators and engines. The costs are grossly disproportionate to the low environmental benefit gained from limited improvements in air quality that may result.	No
Transferring non-hazardous combustible waste to shore for disposal.	P = No E = Effective	If waste were not incinerated offshore, additional cost, safety and environmental implications would be incurred associated with transferring non-hazardous combustible waste to shore for disposal. This would also be unlikely to reduce overall emissions as additional supply vessel visit would be required to collect and transfer the waste to shore, where it would then need to be dealt with.	No
Additional Controls Considered:			
Non-essential machinery will be routinely shut-down on survey vessels.	P = Yes E = Limited	Due to the limited benefit gained from shutting-down non-essential machinery, and the limited risk associated with atmospheric emissions, this control was determined to be unnecessary.	No
Eliminate atmospheric emissions during operation.	P = No E = Effective	Vessels are required for the Otway Basin 3D MC MSS to collect data. Without vessels, the survey would not be able to occur.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Residual Risk Ranking**
Marine Environmental Quality	Negligible	Likely	**Negligible**
Seabirds	Negligible	Likely	**Negligible**
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to be Negligible. TGS considers the adopted control measures are appropriate to manage the impacts of atmospheric emissions during the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements and good industry practice and take into account the specific environmental, social, economic and cultural characteristics of the OA. No effective and practicable alternative or additional control measures were identified as part of the assessment process. Therefore, the predicted impacts to receptors from Atmospheric Emissions are reduced to **ALARP.**			

7.4.5 Impact and Risk Acceptability

Table 96 Demonstration of General Impact and Risk Acceptability for Atmospheric Emissions

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The Residual Risk has been determined to be Negligible.
Ecologically Sustainable Development	The management of the impacts and risks associated with atmospheric emissions proposed by TGS can be carried out in compliance with the five principles of ESD as defined within the EPBC Act. These principles have been considered as part of the development of this EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS's Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	Based on the proposed control measures to be implemented, it is considered that atmospheric emissions will not result in a significant impact on environmental values or sensitivities within the OA, including seabird species and migratory shorebirds which may traverse the OA and be temporarily exposed to atmospheric emissions. It is considered that the proposed control measures provide appropriate protection to marine fauna and other marine users from the potential effects associated with atmospheric emissions. A number of control measures were considered as part of the assessment process, and it was concluded that the addition of any further control measures not already considered would provide little or no additional protection.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the atmospheric emissions has been determined to be Negligible and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. **<u>Draft Wildlife Conservation Plan for Seabirds</u>** Point source atmospheric emissions as a result of the Otway Basin 3D MC MSS are predicted to cause negligible effects to seabirds which may traverse the OA. The Draft Wildlife Conservation Plan for Seabirds does not identify, short-term, point source atmospheric emissions as a threat to seabird populations. The activity is, therefore, considered consistent with the objective of facilitating conservation of seabird populations. Consideration to the effects of chronic atmospheric emissions will be achieved through the implementation of the SEEMP. **<u>AMP Values, Management Prescriptions and IUCN Reserve Management Principles</u>** The management prescriptions for AMPs do not include information on atmospheric emissions from commercial vessels. **<u>Conservation values and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023</u>** Atmospheric emissions are not expected to impact significantly on the environmental values or sensitivities of the South-east Marine Region at a local or regional level.
Social Acceptance – Relevant Person Expectations	During consultation with relevant persons no concerns were raised in regard to possible impacts from atmospheric emissions, and as such no additional control/mitigation measures were expected or put in place as a result. Consequently, the environmental impacts relating to atmospheric emissions from the survey vessels were considered to be at a socially **Acceptable Level**.
External Context – Commonwealth and State Legislative Criteria	TGS will ensure the Otway Basin 3D MC MSS air emissions will comply with the relevant legislative requirements and applicable international conventions, including: • MARPOL 73/78 Annex VI Prevention of Air Pollution by Ships; • PSPPS Act, 1983 (Part IIID Prevention of Air Pollution); • Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007; • Marine Orders Part 97 (Marine Pollution Prevention – air pollution); • Marine Notice 11/2015 Measure to Reduce Greenhouse Gas Emissions from International Shipping; and • Marine Notice 05/2017 Regulations for Air Emissions from Ships.

Criteria for Acceptance	Acceptability Summary
Industry Best Practice	The control measures are based on industry best practice and best practice guidelines, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations which provides guidance on engine emissions, including: • Ensuring vessels are fitted with appropriate emission monitoring and control systems to meet applicable flag state and vessel design class requirements; • Servicing of exhaust systems occurs on a regular basis to ensure that noise and emissions are kept to appropriate levels (no unburned fuels and exhaust gases to create localised pollution); • Require low-sulphur MDO; and • The APPEA Code of Environmental Practice includes an objective to reduce greenhouse gas emissions to an **Acceptable Level** and reduce the risk of impacts to **ALARP**.
ALARP	Total elimination of all impacts associated with atmospheric emissions cannot be achieved, as engines must be used onboard the vessel and there are no practicable alternatives. Following the implementation of the control measures the potential impacts to the environment from atmospheric emissions are likely to be localised in nature and short-term given the relative spatial extent of the vessel's trajectory across the total OA and the duration of the Otway Basin 3D MC MSS. Based on the discussions within the EP, including the potential impacts on the environment and the associated control measures to be implemented, the residual risk from atmospheric emissions from the survey vessels is considered **Negligible** and to **ALARP**. Therefore, the impacts and residual risk from this activity associated with the Otway Basin 3D MC MSS are considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' or above are considered acceptable if the requirements in **Table 51** can be demonstrated and if the level of residual impact and risk are determined to be Moderate or less. Based on the above evaluation, the potential impacts from atmospheric emissions meets the requirements of the impact and risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of atmospheric emissions on all identified receptors to an **Acceptable Level.**

7.4.6 Environmental Performance

Table 97 Environmental Performance Outcomes, Standards and Measurement Criteria for Atmospheric Emissions

Number	Environmental Performance Outcome	Environmental Performance Standard
EPO 21	No release of unplanned objects, emissions or discharges to sea or air	**EPS 186** to **EPS 198**
EPO 22	All unplanned atmospheric emissions produced during the survey (including NO_X, SO_X, CO, CO_2, CH_4 and particulates) meet or exceed the requirements MARPOL Annex VI and Marine Order 97.	**EPS 186** to **EPS 198**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 186**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 187: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Compliance with: MARPOL Annex VI (Regulations for the Prevention of Air Pollution from Ships). Protection of the Sea (Prevention of Pollution from Ships) Act 1983. Marine Order 97 (Air Pollution): • Vessels >400 tonnes require a certificate to demonstrate that they comply with the requirement to prevent unnecessary air pollution; • The vessel engines do not emit excess NOx emissions; • Incinerators used are of an approved standard and it is operated correctly; • Vessels must comply with a plan for energy efficiency and implement a SEEMP; • Vessels shall not emit excess sulphur emissions; • Noxious and toxic substances shall not be emitted through combustion of illegal substances; and • ODS shall not be deliberately released.	**EPS 188**: All vessels used in the Otway Basin 3D MC MSS over 400 gross tonnage will hold an International Air Pollution Prevention Certificate (**IAPP Certificate**) as per the requirements of Marine Order 97 and MARPOL Annex VI.	A pre-mobilisation vessel audit and inspection confirms IAPP Certificate is valid.	VOC Vessel Master Party Chief SEA CSR
	EPS 189: The engines in the vessels used for the Otway Basin 3D MC MSS will meet the prescribed NOx emission levels set within Marine Order 97 and MARPOL Annex VI.	A pre- mobilisation vessel audit and inspection confirms the vessel engines meet the specifications required to operate in accordance with the Marine Order 97 and MARPOL Annex VI.	TGS VOM EA Vessel Master
	EPS 190: The SOx content of the fuel used within the survey vessels will not exceed the limits set within Marine Order 97, the PSPSS Act and MARPOL Annex VI.	Fuel data sheet confirms low sulphur content. A pre-mobilisation vessel audit and inspection confirms the SOx content of fuel used within the survey vessels is compliant with Marine Order 97, the PSPSS Act and MARPOL Annex VI.	TGS VOM VOC EA Vessel Master SEA
	EPS 191: All vessels used during the Otway Basin 3D MC MSS over 400 gross tonnage will have, and comply with, a SEEMP as per Marine Order 97 and MARPOL Annex VI.	A pre-mobilisation vessel audit and inspection confirms a SEEMP is in place. Monitoring in accordance with the SEEMP demonstrates compliance with the SEEMP. Bridge logs demonstrate compliance with the SEEMP.	TGS VOM EA Vessel Master
	EPS 192: Any Incineration onboard the vessels will be undertaken in accordance with Marine Order 97 and MARPOL Annex VI, including the prohibition of incinerating noxious and hazardous substances.	Incineration Logs demonstrate compliance with Marine Order 97 and MARPOL Annex VI	Party Chief SEA CSR Vessel Master

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 193: An ODS Record Book will be maintained if the Seismic Vessel has a rechargeable system that contains ODS as per the PSPPS Act and confirms no planned ODS discharges have occurred.	Where required, A pre-survey vessel audit and inspection confirms an ODS Record Book is available and confirms no planned ODS discharges have occurred.	Party Chief SEA CSR Vessel Master
Vessels will use MDO grade fuel during the survey. The sulphur content of fuel oil used on board vessels for propulsion or operation will not exceed 0.50% m/m.	**EPS 194**: MDO is the primary fuel for vessels associated with the Otway Basin 3D MC MSS. The sulphur content of fuel oil used on board vessels for propulsion or operation will not exceed 0.50% m/m.	The Bunker Note confirms MDO is the primary fuel for use within survey vessels. Oil usage records show MDO fuel is used.	Party Chief SEA CSR Vessel Master
Fuel consumption will be recorded and monitored for abnormal consumption, with corrective action taken if necessary.	**EPS 195**: Fuel use will be recorded and monitored for excessive fuel consumption, with corrective action taken if necessary.	Bridge log confirms fuel use is consistent with the SEEMP. Where excessive fuel consumption is identified, records show the processes for Management of Non-Conformances are followed.	Party Chief SEA CSR Vessel Master
All combustion and incineration machinery will be appropriately maintained as per the manufacturer's guidelines.	**EPS 196**: All combustion and incineration machinery will be appropriately maintained as per the manufacturer's guidelines.	Maintenance logs confirm appropriate maintenance. A pre-mobilisation vessel audit and inspection confirms that combustion and incineration machinery has undergone appropriate maintenance.	Party Chief SEA CSR Vessel Master
Only wastes approved by the vessel's Garbage Management Plan will be incinerated and no oil or other noxious substances will be incinerated.	**EPS 197**: Only wastes approved by the vessel's Garbage Management Plan will be incinerated and no oil or other noxious substances will be incinerated.	Incineration Log demonstrate compliance with the Garbage Management Plan.	Party Chief SEA CSR Vessel Master
Incineration will only occur when the vessel is a distance greater than 12 NM from shore.	**EPS 198**: Incineration will only occur when the vessel is a distance greater than 12 NM from shore.	Incineration Logs (and where required AIS tracking data) demonstrate compliance.	Party Chief SEA CSR Vessel Master

7.4.7 Atmospheric Emissions Impact and Risk Summary

Based on the discussions above, including the potential impacts on the environment and the associated control measures to be implemented, the residual risk from atmospheric emissions generated from the survey vessels and on-board waste incineration is considered **Negligible.**

The suite of control measures to be implemented have been developed in accordance with Industry Best Practice and relevant legislation. Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from atmospheric emissions are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4**, the suite of control measures are considered appropriate to manage the risks and impacts arising from atmospheric emissions during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

7.5 Artificial Light Emissions

7.5.1 Description of Source of the Impact and Risk

Artificial lighting is required on the survey vessels for the health and safety of crew onboard (e.g. deck lighting for night operations) and for safe navigation of vessels underway at sea at night and in poor weather conditions. Different navigation lights are required specific to that particular vessel and size, as well as whether the vessel is engaged in towing and restricted in its ability to manoeuvre.

The primary sources of artificial lighting in the offshore marine environment during the Otway Basin 3D MC MSS will result from the deck and navigational lights onboard the survey vessels. Deck areas need to be lit at all times for personnel safety, with deck lighting typically consisting of bright white lights focused on working areas. Spot lighting may be required for in-sea inspection, deployment, and retrieval of survey equipment. Navigational lights are typically elevated on the vessel, outwards facing, and of lesser intensity than deck lighting.

7.5.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 98**.

Table 98 Environmental Receptors Assessed

Receptor	Section reference
Fish, Sharks, Rays	**Section 7.5.2.1**
Marine Mammals	**Section 7.5.2.2**
Marine Reptiles	**Section 7.5.2.3**
Seabirds	**Section 7.5.2.4**

Artificial light at night (**ALAN**) is a recently acknowledged form of anthropogenic pollution which is rapidly expanding in the marine environment (Davies *et al.,* 2014; Gaston *et al.,* 2021; Tidau *et al*., 2021). ALAN affects marine organisms as it introduces light in places, times and at intensities which it does not naturally occur, and is introducing light with a spectrum that is different from that of natural sources (i.e. sunlight, moonlight or starlight) (Gaston *et al*., 2015). Artificial light can disrupt critical behaviour (e.g. migrations) and cause physiological changes in wildlife, potentially stalling the recovery of a threatened species (Commonwealth of Australia, 2020). Disorientation and behaviour modifications are the two main modes through which ALAN is known to affect marine fauna and are the focus of this EP; however physiological changes are discussed for fish and benthic communities.

Artificial lighting on vessels at sea can attract and disorientate marine animals and affect their physiology (Davies *et al.,* 2014; Poot *et al*., 2008). The effects of ALAN can be particularly high for juvenile animals such as turtles and fledgling seabirds/novice flyers in coastal locations (Telfer *et al*., 1987), and ALAN has been linked to an increased risk of bird collision with vessels (particularly their rigging) (Black, 2005). Procellariiformes (comprising albatrosses, shearwaters, fulmars, prions, large petrels, storm petrels, and diving petrels) are particularly at risk as they are known to aggregate around anthropogenic light sources, with fledging and migratory times particularly vulnerable times for these birds (Le Corre *et al*, 2002; Miles *et al*, 2010; Gjerdrum *et al*., 2021). Several species of Procellariiformes have been identified as present within the OA.

The combination of colour, intensity, closeness, direction, and persistence of light source are key factors in determining the magnitude of environmental impacts (WA EPA, 2010; Commonwealth of Australia, 2020). For example, artificial lights that are fixed or stationary in the marine environment have been shown to attract aggregations of zooplankton and then baitfish and/or squid, which are prey for higher trophic order species that take advantage of these aggregations for feeding (Golder, 2007). Increased amounts of light at night in the marine environment can also possibly be detrimental to marine mammals by allowing predators to see the mammals more easily during normally dark night times.

The potential adverse impacts on marine fauna associated with ALAN is well understood, as is reflected in the development of Commonwealth guidelines designed to mitigate the effects from these activities (Commonwealth of Australia 2020). The National Light Pollution Guidelines for Wildlife recommends using Best Practice Lighting Design to reduce light pollution and minimise the effect on wildlife and undertaking an ERA for effects on listed species for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction, and where there is important habitat within 20 km of a project (Commonwealth of Australia, 2020).

According to the National Light Pollution Guidelines for Wildlife (Commonwealth of Australia, 2020), a 20 km distance threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15 – 18 km and grounding behaviour of fledgling seabirds in response to artificial light 15 km away. Although, the effect of light glow may occur at distances greater than 20 m for some species and under certain environmental conditions (Commonwealth of Australia, 2020).

Potential receptors therefore include fish, sharks and rays, marine turtles, seabirds and migratory shorebirds. As cetaceans predominantly utilise acoustic senses to monitor and navigate their environment, impacts are considered to be unlikely. However, an assessment of potential impacts to marine mammals has been undertaken in **Section 7.5.2.2**, below.

7.5.2.1 Bony Fish and Elasmobranchs

The response of fish to artificial light varies according to species and habitat; for example, it can throw off fine-tuned nocturnal behaviours such as navigation, hunting patterns or the ability to forage while evading predators (Milicich *et al*., 1992; Meekan *et al*., 2001). Lindquist *et al*. (2005) concluded from a study that artificial lighting associated with offshore oil and gas activities resulted in an increased abundance of clupeids (herring and sardines) and engraulids (anchovies) around lighted structures; these species are known to be highly photopositive. Attraction of fish to light may result in an increase in predation from larger fish and sharks on prey species, or exclusion of nocturnal foragers/predators aggregating in the immediate vicinity of the vessels at night (Marchesan *et al*., 2006). These aggregations are generally considered to be localised and not associated with long-term changes to fish abundances or distributions. O'Connor *et al*., (2019) studied the ecological impacts of continuous ALAN during the early life history of marine fish and found that whilst juvenile fish grew at a faster rate under these conditions, they were also more susceptible to higher mortality rates.

Light emissions within the OA will be highly localised, short term and not stationary, limiting the ability to result in lasting behavioural responses by fishes in the area. Moreover, the sound emissions from the survey vessel and support vessels would be expected to provide a deterrent to bony fish and elasmobranchs (see **Section 7.2.2**)

It is considered that the consequence of ALAN on bony fish and elasmobranchs within the OA (including for commercially important species as detailed in **Section 4.7.3**) is minor; with any effects expected to be localised, short-term and ceasing when the activity ceases with no detectable adverse effects to the population.

Based on available evidence, it is considered unlikely (uncommon but has been known to occur elsewhere) that artificial lights will impact bony fish and elasmobranchs.

As such, the residual risk of negative impacts to bony fish and elasmobranchs due to artificial lights associated with the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible x Unlikely*) (**Table 49**).

7.5.2.2 Marine Mammals

Many marine mammals have evolved specialised sight or acoustic techniques to enable successful hunting/prey capture in low light, while others are reliant on suitable levels of light and clear water to enable capture. Cetaceans for example use echolocation as their primary sense for locating and hunting prey, followed by visual means at close range (Simmonds *et al.*, 2004). Artificial lights that are fixed or stationary in the marine environment often attract aggregations of zooplankton and then baitfish and/or squid which are prey for species of pinnipeds and dolphins that take advantage of these aggregations for feeding (Golder, 2007). Increased amounts of light at night in the marine environment can also possibly be detrimental to marine mammals by allowing predators to see the mammals more easily during normally dark night times. However, a number of studies have been undertaken on the effects of artificial lighting from oil and gas exploration activities in the GAB on sea lions and cetaceans and concluded that any impacts would be insignificant (Pidcock *et al*., 2003), and similar studies in North West Australia and Canada have found no evidence that cetacean feeding and breeding was being impacted from offshore installations (BHP Billiton, 2005).

The residual risk of artificial light emissions on marine mammals from vessels associated with the Otway Basin 3D MC MSS has been assessed as **Negligible** (*Negligible* x U*nlikely*).

7.5.2.3 Marine Reptiles

As discussed in **Section 4.5.5**, the loggerhead turtle, leatherback turtle and green turtle are known to occur within the OA, each of which are listed species under the EPBC Act as either endangered or vulnerable. There are no species of marine snake known to occur within the OA. The marine turtles are known to use the waters within the OA for foraging and feeding but there are no breeding behaviours known to occur within the OA, or within the wider EMBA.

The Environmental Protection Authority (**EPA**) *Environmental Assessment Guide No. 5 – Protecting Marine Turtles from Light Impacts* (EPA, 2010); the *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017a), and the DoEE Species Profile and Threats Database have been considered as part of the preparation of this EP, and do not identify artificial light from vessels underway in the offshore marine environment as creating a risk for turtles.

The National Light Pollution Guidelines for Wildlife (Commonwealth of Australia 2020) recommends a 20 km nominal distance from light sources to important habitat be applied to protect the conservation value of natural darkness and mitigate potential impacts to marine turtles, however, there are no BIAs for marine reptile species of relevance to the OA.

ALAN from the survey vessels is not expected to have an effect on the foraging and feeding behaviour of turtles within the OA given that the vessels will not be stationary for extended periods of time, and the OA does not represent a particularly important area to foraging marine reptiles as evidence by the lack of BIAs identified in the region.

The residual risk of artificial light emissions on marine reptiles from the vessels associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.5.2.4 Seabirds

There are twelve seabird species with BIAs reported to overlap the OA and twenty-nine known to occur (**Section 4.5.7**), the majority of which are albatross, petrel and shearwater species. Seabirds are known to commonly strike vessels lit with artificial light at night, particularly vessels with significant exposed rigging/lines. Artificially lit installations, vessels or structures also act to attract seabirds, particularly in otherwise dark areas and for migratory birds travelling at night (Poot *et al.*, 2008). From TGS's previous offshore MSSs in New Zealand and Australia, there have been no bird strikes during night-time.

As stated in the previous section on marine mammals, marine organisms such as zooplankton and small fish are often attracted to artificial light sources and these aggregations can create an enhanced food source for seabirds (Rich and Longcore, 2006). However, as the vessels will be continuously moving during the survey the attraction of zooplankton and baitfish will be highly unlikely to occur, particularly in comparison to fixed lighting sources (e.g. lighthouse, platforms, bridges, etc.).

Seabirds are vulnerable to artificial lighting during nocturnal activities, particularly during the breeding season, through increased predation when leaving and returning to the nesting colony. Cianchetti-Benedetti *et al*. (2018) found artificial light disrupted adult nest attendance, affecting weight gain in chicks. Fledglings are considered more vulnerable to the impacts of artificial light than adults due to unfamiliarity, the immature development of ganglions in the eye at fledging and the potential connection between light and food (Montevecchi, 2006; Mitkus *et al*., 2018). Albatrosses, petrels, and shearwaters are known to aggregate around anthropogenic light sources, with fledging and migratory times particularly vulnerable times for these birds (Le Corre *et al*, 2002; Miles *et al*, 2010; Gjerdrum *et al*., 2021). Strike risk is a potential issue where lit structures intersect flight paths when foraging and during migration (Collins *et al*., 2022).

The National Light Pollution Guidelines for Wildlife (Commonwealth of Australia, 2020) recommends a 20 km nominal distance from light source to important habitat be applied to protect the conservation value of natural darkness and mitigate potential impacts to listed seabirds. Fledglings are more affected by artificial lighting than adults due to the synchronised mass exodus of fledglings from their nesting sites. They can be affected by lights up to 15 km away (Commonwealth of Australia, 2020). There are no breeding BIAs within the OA. The closest known breeding/nesting area for seabirds is reported to be King Island, situated approximately 40 km from the OA at the nearest point. At this distance, there is limited propensity for artificial light to impact seabird breeding/nesting behaviours.

The Draft Wildlife Conservation Plan for Seabirds (Commonwealth of Australia, 2019) characterised light pollution as a moderate risk to seabirds, having a minor impact on individuals but no effect at a population level. The guidance recommends mitigating against impacts of light pollution by boats at sea and around breeding colonies, though no specific management actions are prescribed.

The residual risk of artificial light emissions on seabirds from vessels associated with the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

7.5.3 Decision Context

The decision context for Artificial Light Emissions has been assessed as Type A for all receptors, given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

7.5.4 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

A Hierarchy of Controls methodology (**Table 99**) has been used to assess control measures to determine the benefits in their use towards risk reduction. The control measures that will be implemented during the Otway Basin 3D MC MSS to manage the impacts from artificial light emissions to **ALARP** are included in **Table 100.** The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 99 Hierarchy of Control Measures for Artificial Light Emissions

Eliminate	Collision prevention and maritime regulations require specific navigation lighting to be implemented. Likewise, provision of safe working conditions at night achieved through employing suitable deck lighting is required to minimise any health and safety incidents. As a result, artificial light emissions cannot be completely eliminated.
Substitute	Navigation lighting cannot be substituted given the requirements cited within the COLGREGs, Marine Order 21 and Marine order 30. Sufficient work lighting cannot be substituted either.
Reduce	Work lighting will be extinguished wherever possible when not required, and as far as practicable work lighting will be focused inwards.
Mitigate	Control measures have been assessed within **Table 100** in order to mitigate the impacts from artificial light emissions to **ALARP** levels. Those which are appropriate and are not impracticable or unfeasible due to disproportionately large costs will be implemented during the Otway Basin 3D MC MSS. Likewise, those which do not diminish the safety of on-board operations and navigation will be implemented during the Otway Basin 3D MC MSS.

Table 100 Assessment of Control Measures for Artificial Light Emissions

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of routine permissible waste discharges.	Yes
Adherence to the requirements of the national and international legislation, including the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of Safety of Life at Sea (SOLAS) as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21 and 30, including: • Appropriate use of lighting, navigation and radio communication at sea; • 24-hour bridge and radar watch by qualified watch-keepers.	P = Yes E = Effective	It is a legislative requirement to meet the relevant aspects of COLREGs, Marine Order 21 and Marine Order 30 as listed below: • COLREGs Part A (General) • COLREGs Part B (Sound and Light Signals) • COLREGs Part C (Lights and Shapes) • COLREGS Annex I (Positioning and technical details of lights and shapes) • Marine Order 21 (Safety of Navigation and Emergency Procedures) • Marine Order 30 (Prevention of Collisions).	Yes
Good Industry Practice:			
Artificial lighting is reduced to minimum levels, wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will be reduced to minimum levels, wherever practicable.	P = Yes E = Effective	Outward facing lighting is required for navigation/safety/visibility at sea. Work lighting (e.g., in deck areas) will be directed inward as much as possible whilst still supplying the minimum adequate lighting required to maintain safe working conditions for all areas where crew are operating on deck. Navigation lighting to be compliant with relevant guidance for safe passage at sea and specific to each vessel and the activities it is conducting. Good industry practice, environmental benefit outweighs additional cost.	Yes
Development and implementation of Marine Fauna Mitigation Plan.	P = Yes E = Effective	One of the roles of the MFO onboard the Seismic Vessel is to develop a Marine Fauna Mitigation Plan, to be submitted to TGS prior to the pre-mobilisation survey and audit commencing. This plan will demonstrate the following, at a minimum: • MFOs are trained, dedicated and experienced • Responsibilities and authorities of MFOs to ensure the plan is communicated and available to those roles that are required to implement the controls; • Communications protocols for relaying marine fauna observations to the Seismic Operator, Vessel Master and vessel crew as required. • Survey Plan – describes the proposed activity including location and timing, acoustic source and streamer configuration, equipment (vessels) and key geographic locations such as BIAs and nominated exclusion zones. • Implementation Plan – details how the marine fauna management controls within the EP will be implemented; • Handling procedures for the retrieval of marine fauna entangled in towed equipment or seabirds on the vessels' deck. Good industry practice, environmental benefit outweighs additional cost.	Yes
Seabird collisions (both fatal and non-fatal) with the survey vessels will be recorded.	P = Yes E = Partial	The National Light Pollution Guidelines recommends that bird strikes are recorded. All crew will be instructed to remain vigilant for seabird collisions with the survey vessels (such as grounding on the vessels deck) and any observed/discovered incidents will be recorded and reported within the final survey report. Good industry practice, environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternatives/Substitutes Controls Considered:			
Use of lighting sources with wavelengths that are less disruptive to marine organisms, as listed in the National Light Pollution Guidelines for Wildlife.	P = No E = No	Given the large variety of marine organisms that may be present, and that their varying sensitives to different light wavelengths, this control measure is not regarded as being practical and is likely to be of minimal overall benefit. The costs of replacing lighting are also considered disproportionate to any benefit gained.	No
Eliminate lighting.	P = No E = Very Effective	Adequate lighting is required for safe work of all crew onboard the vessels and navigation lighting is required for collision avoidance and visibility at sea. Safety costs are disproportionate to benefits.	No
Additional Controls:			
Inward/downward facing lighting only.	P = No E = Effective	Outward facing lighting is required for navigation/safety/visibility at sea, in accordance with the COLREGS, Marine Order 21 and Marine Order 30. It is a regulatory requirement to have appropriate navigation lighting on all vessels from sunset to sun rise. However, there are benefits to ensuring deck/workspace lighting is inward/downward facing to reduce light spill as far as reasonably practicable, see directional lighting control measure above.	No
Use of non-reflective, dark-colour surfaces.	P = No E = Effective	As the survey vessels have already been built, changes to the ship materials to follow all design principles of Best Practice Lighting Design would require a re-fit of the vessels. The costs of doing this are considered disproportionate to any benefit gained	Yes
No acquisition during hours of darkness.	P = No E = Effective	This measure would effectively double the time to acquire the Otway Basin 3D MC MSS. By extension, this would extend the duration of disturbance to sensitive environmental receptors and would increase potential conflict and displacement with commercial and recreational fishers. Additionally, vessels would remain at sea necessitating they display navigation lighting and provide safe amounts of deck lighting for crew even if not acquiring data (e.g., during darkness hours). Consequently, costs are considered disproportionate to benefits.	No
Use of filters over existing lighting.	P = No E = Partial	Filters can be fitted over lights to eliminate shorter light wavelengths. This control measure is not regarded as being practical and is likely to be of minimal overall benefit. Significant light impacts to birds and turtles are not expected due to the transient nature of the survey and support vessels and the offshore location of the survey. Given the time and cost required to change lighting, this option was considered impractical and disproportionate to the limited benefit that would be gained.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Data acquisition will only occur outside of seabird breeding/nesting periods.	P = No E = Limited Effectiveness	The OA is located 40 km from the nearest known seabird nesting area. The National Light Pollution Guidelines for Wildlife recommends a nominal distance of 20 km from important habitat in order to minimise any potential adverse effects. As discussed within Section 7.5.1, the light source will constantly be moving; any attraction, distraction or disorientation of seabirds would be highly unlikely, particularly in comparison to a fixed light source. Therefore, any minor environmental gains from limiting data acquisition periods to outside of key nesting periods are considered to be at a disproportionally increased cost to the survey. Therefore, this control measure is considered to provide limited overall benefit.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Residual Risk Ranking**
Fish, Sharks, Rays	Negligible	Unlikely	Negligible
Marine Mammals	Negligible	Unlikely	Negligible
Marine Reptiles	Minor	Unlikely	Low
Seabirds	Minor	Unlikely	Low
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to range from Negligible to Low for the identified receptors. TGS considers the adopted control measures are appropriate to manage the impacts of artificial light emissions during the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements and good industry practice and take into account the specific environmental, social, economic and cultural characteristics of the OA. No effective and practicable alternative or additional control measures were identified as part of the assessment process. Therefore, the predicted impacts to receptors from artificial light emissions are reduced to **ALARP.**			

7.5.5 Impact and Risk and Acceptability

Table 101 Demonstration of General Impact and Risk Acceptability for Artificial Light Emissions

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The Residual Risk has been determined to range from Negligible to Low.
Ecologically Sustainable Development	The management of the impact and risks associated with artificial light emissions proposed by TGS can be carried out in compliance with the five principles of ecologically sustainable development as defined within the EPBC Act. These principles have been considered as part of the development of this EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS's Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	Given that the survey vessels, and ultimately artificial light source, involved in the Otway Basin 3D MC MSS will be constantly moving and the relatively low amounts of artificial light that will be emitted from the vessels, the impacts to the marine environment from artificial light emissions are likely to be short term, highly localised, and quickly recoverable. While the OA is overlaps BIAs of several shark, mammal and seabird species, the levels of artificial light emission will be similar or less (with mitigation measures in place) to those generated from maritime traffic in the area associated with coastal shipping and fishing activity. The proposed control measures provide appropriate protection to the marine environment from artificial light emissions. Further/alternative control measures (such as no night-time acquisition) are considered to provide little or no further protection from artificial light emissions, while greatly increasing the duration and cost of the survey. Increases to the duration of the survey are particularly prohibitive as it increases the time environmental receptors are exposed to disturbance and also increases the potential for conflict and displacement with the fishing industry. As a result, no further/alternative control measures have been adopted.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the artificial light emissions has been determined to range between Negligible to Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. The following Management Plans, Species Recovery Plans and Conservation Advices have been taken into consideration when determining the acceptability of effects of artificial light emissions: **Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017)** The recovery plan for marine turtles recommends that best practice light management is undertaken to minimise light impacts to marine turtles, so their behaviours are not changed, and they do not become displaced from important habitats. There are no turtle breeding grounds within the OA or EMBA. The proximity of the OA to marine turtle foraging BIAs is not of concern, given that marine turtle foraging is generally constrained to daylight hours when artificial light generated by the survey vessel will be minimal. The proposed activities are considered consistent with the objective of facilitating recovery of marine turtles. **Draft Wildlife Conservation Plan for Seabirds 2019** The Draft Wildlife Conservation Plan for Seabirds objectives seek to manage and minimise the adverse impacts of anthropogenic disturbance to breeding and roosting seabirds and enhance contingency plans to prevent, respond to or remediate environmental emergencies that have an impact on seabirds and their habitats. Given there is no emergent land within the OA and the closest known seabird breeding/nesting site is King Island, approximately 40 km east of the OA, the lighting control measures proposed herein, and transient nature of the light source generated from the moving Seismic Vessel means that the planned survey approach is compliant with the objectives of the conservation plan. The proximity of the OA to seabird foraging BIAs is not of concern, given that foraging for seabirds is mostly constrained to daylight hours when artificial light generated by the Seismic Vessel will be minimal. A 20 km distance threshold between light source and important seabird habitat is recommended to be maintained, according to the National Light Pollution Guidelines for Wildlife (Commonwealth of Australia 2020). Given that the closest seabird breeding/nesting site is King Island, located approximately 40 km east of the OA, the Otway Basin 3D MC MSS is compliant with the relevant Commonwealth guidelines. The proposed activities are considered consistent with the objective of facilitating conservation of seabird populations. **Conservation Management Plan for the Blue Whale;** **Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale); and** **Conservation Advice for Sei and fin Whales** The conservation and management guidance does not identify artificial light pollution as a threat to relevant species and no management actions are prescribed. Artificial light emissions generated during the Otway Basin 3D MC MSS are not predicted to impact blue whale, humpback whale, Sei or fin whales. The proposed activities are considered consistent with the conservation and recovery of relevant species. **AMP Values, Management Prescriptions and IUCN Reserve Management Principles** The management prescriptions for AMPs do not include information on artificial light emissions from commercial vessels.

Criteria for Acceptance	Acceptability Summary
	<u>**Conservation values and objectives of the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023**</u> Artificial light emissions are not expected to impact significantly on the environmental values or sensitivities of the SEMR at a local or regional level.
Social Acceptance – Relevant Person Expectations	Concerns were raised by relevant persons around the potential impacts of artificial light emissions on seabirds given the Otway Basin 3D MC MSS will be operating 24/7. Although no additional control/mitigation measures have been put in place with regard to light emissions, the control measures associated with industry best practice are considered appropriate to ensure the environmental impacts relating to light emissions from survey vessels are considered to be at socially **Acceptable Level.**
External Context – Commonwealth and State Legislative Criteria	Lighting requirements for the Otway Basin 3D MC MSS are determined by relevant legislative requirements (i.e., COLREGS, SOLAS, Marine Order 21 and Marine Order 30). Legislated requirements for safe working conditions and safe navigation will be met.
Industry Best Practice	The control measures to decrease artificial light emissions are based on industry best practice and best practice guidelines, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations. Geophysical vessels must ensure that their emissions are kept to appropriate levels; and • The APPEA Code of Environmental Practice. Details within this document relate mainly to offshore operations such and offshore exploration/drilling and production facilities where light emissions are recommended to be reduced to **ALARP** and **Acceptable Levels**. A similar approach could feasibly be expected of survey vessels operating in offshore areas.
ALARP	Total elimination of all impacts associated with artificial lighting emissions cannot be achieved, as lighting must be used onboard the vessels to maintain safe operations and navigation and there are no practicable alternatives. Following the implementation of the control measures, the potential impacts to the marine environment and associated receptors from artificial light emissions are likely to be short term and localised. Based on the assessment within this EP, including the potential impacts on the environment and the associated controls measures to be implemented, the impact of artificial light emitted from the survey vessels is considered to be **Low** and reduced to **ALARP**. Therefore, the impacts and associated residual risk from this activity are considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' or above are considered acceptable if the requirements in **Table 51** can be demonstrated and if the level of residual impact and risk are determined to be Moderate or less**.** Based on the above evaluation, the potential impacts from artificial light emissions meets the requirements of the impact and risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of artificial light emissions on all identified receptors to an **Acceptable Level.**

7.5.6 Environmental Performance

Table 102 Environmental Performance Outcomes, Standards and Measurement Criteria for Artificial Light Emissions

Number	Environmental Performance Outcome	Environmental Performance Standard
EPO 23	Lighting is reduced to levels required to support safe navigation and on-board operations, so as to limit impacts from artificial light to individual non-listed, listed threatened, listed migratory or listed marine fauna protected under the EPBC Act to minor, short term effects and ensure biologically important behaviours can continue.	**EPS 199** to **EPS 206**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 199**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 200: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Adherence to the requirements of the national and international legislation, including the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of Safety of Life at Sea (SOLAS) as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21 and 30, including: • Appropriate use of lighting, navigation and radio communication at sea; • 24-hour bridge and radar watch by qualified watch-keepers.	**EPS 201**: Vessel navigational lighting and equipment is compliant with COLREGs, SOLAS and Marine Orders 21 and 30.	Vessel certification confirms compliance with applicable Regulations.	VOC Vessel Master Party Chief
Artificial lighting is reduced to minimum levels, wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will reduced to minimum levels, wherever practicable.	**EPS 202**: Vessel crews are instructed to reduce artificial lighting levels, wherever practicable, whilst maintaining safe working conditions and navigation during an Environmental Induction.	Induction records show Environmental Induction includes instruction on the measures to reduce artificial lighting levels, whilst maintaining safe working conditions and navigation in accordance with the COLREGS, Marine Order 21 and Marine Order 30. Induction records confirm vessel crew attended an Environmental Induction.	Party Chief SEA CSR
	EPS 203: Non-essential lighting will be switched off when not in use.	Pre-mobilisation audit and inspection prior to operations beginning identifies any non-essential lighting, along with vessel crew inductions.	Vessel Crew
	EPS 204: External lighting will be directed inboard and onto the deck where practicable.	Pre-mobilisation audit and inspection prior to operations beginning identifies the opportunity to direct external lighting inward, along with vessel crew inductions.	Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 205: Essential navigation lighting to maintain compliance with COLREGS, Marine Order 21 and Marine Order 30 is required.	Vessel certification confirms compliance with applicable Regulations Induction records show Environmental Induction includes instruction on the measures to reduce artificial lighting levels, whilst maintaining safe working conditions and navigation in accordance with the COLREGS, Marine Order 21 and Marine Order 30.	Party Chief
Development and implementation of Marine Fauna Management Plan.	**EPS 206:** One of the roles of the MFO onboard the Seismic Vessel is to develop a Marine Fauna Mitigation Plan, to be submitted to TGS prior to the pre-mobilisation survey and audit commencing. This plan will demonstrate the following, at a minimum: • MFOs are trained, dedicated and experienced • Responsibilities and authorities of MFOs to ensure the plan is communicated and available to those roles that are required to implement the controls; • Communications Plan – details the protocols for relaying marine fauna observations to the Seismic Operator, Vessel Master and vessel crew as required. • Survey Plan – describes the proposed activity including location and timing, acoustic source and streamer configuration, equipment (vessels) and key geographic locations such as BIAs and nominated exclusion zones. • Implementation Plan – details how the marine fauna management controls within the EP will be implemented; and • Handling procedures for the retrieval of marine fauna entangled in towed equipment or seabirds on the vessels' deck.	Pre-mobilisation audit and inspection confirms the Marine Fauna Management Plan has been developed Induction records outline the content of inductions and personnel present. MFOs daily and weekly logs and Bridge logs confirm the Marine Fauna Mitigation Plan is being implemented.	MFO EA SEA CSR

7.5.7 Artificial Light Emission Impact and Risk Summary

Based on the assessment above, including the identification of potential impacts on the environment and the associated controls measures to be implemented, the impact of artificial lights emissions generated from the survey vessels is considered to be **Low.**

The suite of control measures to be implemented have been developed in accordance with Industry Best Practice and relevant legislation. Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from artificial light emissions are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4**, the suite of control measures is considered appropriate to manage the risks and impacts arising from artificial light emissions during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

8 Environmental Impacts and Risks from Unplanned Activities

Unplanned activities are those that are non-routine and are rare during MSS operations. However, the potential impacts and risks associated with any unplanned events must be given serious consideration as their consequences can be severe. The impact and risk assessment has been undertaken for each unplanned activity listed in **Table 103**.

Table 103 Unplanned Activities Assessed

Unplanned activity	Section reference	Residual risk
Introduction of invasive marine species	**Section 8.1**	Low
Streamer loss	**Section 8.2**	Low
Vessel collision, sinking or bunkering incident and associated hydrocarbon spill	**Section 8.3**	Low
Hydrocarbon spill response	**Section 8.4**	Low
Accidental release of hazardous and non-hazardous materials	**Section 8.5**	Low

This section of the EP goes through the impact and risk evaluation for each of the unplanned activities listed above that could potentially be associated with the Otway Basin 3D MC MSS, for each of the receptors of relevance within the OA and wider environment should such an incident occur, using the methodology described within **Section 6**. This evaluation will demonstrate that the impacts and risks associated with the Otway Basin 3D MC MSS will be reduced to **ALARP** and will be of an **Acceptable Level**. This will be achieved largely through the implementation of control measures, operational procedures and operating to Good Industry Practice.

8.1 Introduction of Invasive Marine Species

8.1.1 Description of Source of the Impact and Risk

Invasive marine species (**IMS**) are foreign marine aquatic plants and animals that have colonised and established new populations in areas beyond their natural range. IMS are typically carried as larvae or juveniles on international vessels, either in niche areas on vessel hulls or in their ballast and/or bilge water. The survey vessels associated with the Otway Basin 3D MC MSS have the potential to introduce IMS through the discharge of ballast water containing IMS (either as adults and juveniles or eggs/larvae) or through translocation of IMS through biofouling of the vessel hull, internal seawater systems, or immersible equipment (i.e. towed equipment).

As most species have well defined tolerances to environmental conditions (e.g. temperature, salinity, light), not all introduced species successfully colonise new environments. However, if the source and destination environments are sufficiently similar, larvae may successfully establish new colonies which may outcompete and/or predate on native species, causing environmental impacts that are often difficult to control. Likewise, incursions of highly adaptable species, able to successfully proliferate under dynamic environmental constraints, pose similar risks to native species ecology and persistence. Shallow coastal marine environments surrounding key maritime infrastructure are particularly susceptible to the colonisation of IMS, which largely reflects the accidental transport of IMS by international shipping to marinas and ports (Wells *et al*., 2009).

An introduced species is only considered 'invasive' once it begins to cause negative consequences on its new environment (Bax *et al.*, 2003) and once established, marine pests are usually difficult to manage or eradicate (Fletcher *et al.*, 2017). For an IMS to become established, there are various conditions which must be met, including surviving the introduction process, ability to overcome abiotic factors and adapt to a new trophic niche, and the ability of the recipient environment to facilitate survival and establishment (Streftaris *et al.*, 2005). Gebuzri and McCarthy (2018) suggest that there are several ecological and life-history traits which regularly occur in IMS from different taxa and can be associated with their success. Many of these traits are associated with reproduction, including having the ability to form resting stages, a life-history strategy consisting of pelagic larval dispersal or direct development, having a high reproductive rate and plasticity in resource utilisation (Gebuzri and McCarthy 2018).

The '*National Biofouling Management Guidance for the Petroleum Production and Exploration Industry*' states that immersible equipment associated with MSSs do not normally pose a threat for biofouling accumulation and translocation as most components are generally free of biofouling, except for the streamers which may accumulate biofouling organisms in the joints. The most likely biofouling organisms in open, deep waters growing on the streamers are goose barnacles and green filamentous seaweed which are not considered marine pests (Marine Pest Sectoral Committee, 2018).

The NOPSEMA information paper '*Reducing marine pest biosecurity risks through good practice biofouling management*' (NOPSEMA paper N-04750-IP1899) states that, at a minimum, NOPSEMA expects titleholders, and their contracted vessels apply relevant guidance from the IMO Biofouling Guidelines. These guidelines provide an internationally consistent approach to biofouling management and record keeping, with the key recommendation being the development and implementation of a Biofouling Management Plan and Biofouling Record Book. These guidelines have been adopted as control measures within **Table 109.**

IMS and diseases translocated by shipping, fishing vessels, other vessels and tourism have been identified as a source of pressure on the conservation values of the South-east Marine Reserves Network within the South-east Commonwealth Marine Reserves Network Management Plan 2013 – 2023.

8.1.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity, as listed in **Table 104**.

Table 104 Environmental Receptors Assessed

Receptor	Section reference
Plankton	**Section 8.1.2**
Benthic habitats (banks, shoals and reefs)	
Benthic invertebrates	
Marine fauna	
EPBC Act listed marine fauna	
Marine protected areas and sensitive areas	

Once introduced, IMS can have significant and irreversible impacts on the marine ecosystem. Due to a lack of natural competitors or predators, the following adverse effects on the receiving environment may occur following the establishment of an IMS:

- Out-competing and/or displacing native species;
- Increase in predation and possible depletion of native flora and fauna; and
- Changing the nature of the environment through altering the abundance and diversity of native species, resulting in a change to the functioning of the communities.

The establishment of IMS can have consequences which cascade through the trophic structure, affect commercially important species and aquaculture, or which impact other marine users.

Should an IMS population establish, the management options available to regulatory agencies are limited primarily to continual monitoring and control of the IMS population, or to mitigating the impacts from its establishment. Such measures are commonly associated with a high economic or labour encumbrance.

The OA is unlikely to support the establishment of IMS due to the unfavourable water depths (approximately 97 – 5,000 m) and the limited availability of suitable habitat. Areas of hard substrate and topographic relief supporting benthic species may occur in association with the Zeehan AMP (**Section 4.4**) and the West Tasmania Canyons (**Section 4.4.3**). Successful establishment of IMS in relation to these substrates could potentially result in long-term impacts to the regionally significant ecological communities present.

Highly disturbed, shallow water environments (e.g. ports and marinas) are more susceptible to colonisation than open-water environments such as the OA, where the rate of dilution and the degree of dispersal are high Williamson and Fitter, 1996; Paulay *et al*., 2002). However, the risk of an IMS establishing itself as result of the Otway Basin 3D MC MSS is no different than the various shipping operations (e.g. commercial shipping and commercial fishing) that occur within the wider Otway Basin and GAB. The biosecurity of these vessel movements is regulated by various legislative requirements which are considered to be industry best practice. These requirements have been utilised to form the basis of the control measures outlined in **Section 8.1.3**.

Prior to entering Australian waters, all vessels are required to obtain DAFF biosecurity clearance (via submission of a Pre-Arrival Report at least 12 hours prior to arrival) to confirm that the vessel is meeting requirements of the *Biosecurity Act 2015* for entry into Australian waters. Survey mobilisation will only occur after clearance is received and a valid anti-fouling certificate is confirmed. Valid hull anti-fouling certificates will meet the requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and the requirements of the *Protection of the Sea (Harmful Antifouling Systems) Act 2006*.

Vessels arriving in Australian waters, will also be required to adhere to the Australian Ballast Water Management requirements, including restrictions on exchange of ballast water to the open ocean. Vessels will not exchange ballast water within 12 NM of the Australian coastal baseline or in water depths of less than 50 m (noting the shallowest depth in the OA is approximately 97 m).

Submersible equipment used as part of survey activities may on occasion be retrieved out of the water such as for maintenance purposes and during transit. The time this equipment spends outside of the water will facilitate the desiccation and death of any biofouling present. Streamers are also routinely cleaned to prevent excessive biofouling that could lead to interference of the received signal, and consequently, the quality of the seismic data. Inspection, cleaning and maintenance of survey equipment during retrieval will be implemented as a management measure throughout the Otway Basin 3D MC MSS.

Based on the control measures that will be implemented, it is considered that the residual risk of introducing IMS as part of the Otway Basin 3D MC MSS is **Low** (*severe x remote).*

8.1.3 Evaluation of Known and Potential Impacts and Risk to Other Marine Users

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 105**.

Table 105 Relevant Persons and Other Marine Users Assessed

Receptor	Section reference
Commercial fisheries	**Section 8.1.3**
Commercial shipping	
Tourism and recreation	
Divers (commercial and recreational)	
Petroleum exploration and production activities	

Potential risks from the establishment of an IMS to relevant persons and other marine users include:

- Impacts on human health through presence and/or release of toxins or toxic tissues;
- Predation (leading to depletion) of, and competition with, commercial stocks, including wild fisheries and aquaculture, and/or impacts to their associated habitats;
- Nuisance biofouling causing damage to and/or smothering of industrial marine equipment or local infrastructure;
- Impacts to shipping logistics, efficiency and feasibility; and
- Reduction of aesthetics in coastal environment and/or water column.

Several identified relevant persons associated with the OA rely on the presence and use of healthy native flora and fauna and ecologically sustainable populations. As outlined above, in the unlikely event of the establishment of an IMS, these native flora and fauna could be displaced either through direct establishment of the IMS, through increased predation and competition or as a result of changes in environmental conditions driven by the IMS ecology.

Commercial abalone fishers around Portland (VIC) are currently being impacted by the abalone viral ganglioneuritis and have raised specific concerns about the further introduction and spread of fish disease from the operation of the survey vessels (see **Section 5** and **Appendix K**). TGS will adopt strict biosecurity control measures (see **Table 107**) to ensure there is no introduction or spread of disease as a result of vessel movement during the Otway Basin 3D MC MSS.

The residual risk of introducing IMS during the Otway Basin 3D MC MSS has been assessed as **Low** (*severe* x *remote*).

8.1.4 Decision Context

The decision context for the introduction of IMS has been assessed as Type A given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

8.1.5 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

Control measures that will be put in place during the Otway Basin 3D MC MSS to manage the potential risks associated with IMS to **ALARP** have been listed in **Table 107**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction based on a Hierarchy of Controls methodology (**Table 106**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 106 Hierarchy of Control Measures for the Introduction of Invasive Marine Species

Eliminate	To completely eliminate the risk of the establishment of any IMS, the transport of vessels into Australian waters would need to be eliminated. However, the Otway Basin 3D MC MSS cannot be conducted without the use of a Seismic Vessel and such vessels are unlikely to be available in Australian waters.
Substitute	As per the above, and at this point in time, there are no validated approaches which could be adopted to gather information on geologic formations below the seabed at the required resolution. Therefore, there is no substitute to a seismic vessel undertaking the Otway Basin 3D MC MSS.
Reduce	Control measures to reduce the risk of the establishment of IMS have been detailed within **Table 107**. These include restriction to the discharge of ballast water, maintenance of adequate anti-fouling systems and cleanliness of the vessels undertaking the Otway Basin 3D MC MSS.
Mitigate	Control measures have been assessed within **Table 107** to mitigate the risks of an IMS establishing within the OA or connected marine environments. The risks of unplanned activities should be eliminated, substituted or reduced, with mitigation primarily used for those activities in which impacts will occur. However, TGS will report any sighting or suspicion of IMS as per the measure outlined in **Table 107** in order to mitigate the potential impacts to **ALARP**.

Table 107 Assessment of Control Measures for the Introduction of Invasive Marine Species

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of IMS.	Yes
Adherence to the Australian Ballast Water Management Requirements (Version 8). Vessels will manage ballast water exchange/discharge using one of the following approved methods of management: • An approved ballast water management system; • Ballast water exchange conducted in an acceptable area (as defined in the Ballast Water Management Requirements (Version8)); • Use of low-risk ballast water (such as fresh potable water, high seas water or fresh water from an on-board fresh water production facility); • Retention of high-risk ballast water on board the vessel; or • Discharge to an approved ballast water reception facility.	P = Yes E = Effective	Compliance with these requirements will reduce the risk of potential IMS from establishing within the Otway Basin from the discharge of ballast water. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
In accordance with the Ballast Water Management Requirements (Version 8), vessels will not exchange ballast water within 12 NM from the nearest land and in water depths of less than 50 m unless sourced from Australian waters.	P = Yes E = Effective	Regulation D-2 of the Ballast Water Management Convention as implemented through the Australian Ballast Water Management Requirements, requires vessel s to exchange ballast water at least 12 NM from the nearest land and in water at least 50 m deep. Compliance with these requirements will reduce the risk of potential IMS establishing through the discharge of ballast water. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
Vessels will have a Ballast Water Management Plan in place and valid Ballast Water Management Certificate (unless an exemption applies or is obtained from (DoCCEEW).	P = Yes E = Effective	As each ship is different, so are ballast water management practices. As such, having a Ballast Water Management Plan and Ballast Water Management Certificate appropriately maintained for each relevant vessel is important so that the potential for the introduction and establishment of IMS is reduced to **ALARP**. The Ballast Water Management Plan details the approved ballast water management method while the Ballast Water Management Certificate verifies the vessel has been surveyed to a standard compliant with the IMO Ballast Water Management Convention. This control measure is in accordance with the Australian Ballast Water Management Requirements and is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
All vessels will maintain a complete and accurate Ballast Water Record System that is consistent with the Ballast Water Management Requirements (Version 8).	P = Yes E = Effective	The Ballast Water Record System identifies when ballast water is taken on board, circulated, or treated for ballast water management purposes, and discharged to the sea or a reception facility, and accidental or other exceptional discharges of ballast water. Ballast water records will be used to confirm that ballast water management is undertaken in accordance with the Australian Ballast Water Management Requirements. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
Vessels entering Australian territorial waters will obtain all the necessary DAFF biosecurity approvals, prior to mobilisation.	P = Yes E = Effective	Operators of all vessels utilised during the Otway Basin 3D MC MSS will provide information on how biofouling has been managed prior to arriving in Australian territorial seas through DAFF Pre-Arrival Report. Clearance confirms that the vessels meet the requirements of the Biosecurity Act 2015 for entry into Australian waters, including review of a ballast water report by a biosecurity officer. Mobilisation of the vessels to the OA will only occur after clearance is confirmed. Clearance confirms that the vessel does not present a high risk to the marine environment in Australian waters and therefore reduces the likelihood of IMS being introduced. The Ballast Water Report provided during reporting identifies if the vessel has or intends to discharge internationally sourced ballast water, and management will be conducted as determined by DAFF. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
All vessels utilised for the Otway Basin 3D MC MSS will hold a valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate.	P = Yes E = Effective	Under the Biosecurity Act 2015, the DAFF requires all vessels visiting Australian waters for the purpose of the Otway Basin 3D MC MSS to hold a valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate. DAFF administers Ship Sanitation Certification requirements on behalf of the Department of Health. These documents are aimed at controlling the spread of international listed human diseases by controlling any vectors of the diseases that could potentially be carried on a vessel. This is achieved by inspecting for and controlling animal vectors (rodents and mosquitoes), preventing the discharge of untreated ballast water, checking certification of potable water and sewage, and biosecurity measures for human carriers of disease. Australian renewal of a ship sanitation control exemption certificate may be requested by the master or agent of a vessel when submitting the PAR or by submitting a Ship Sanitation Certificate Service Request through the DAFF Maritime and Aircraft Reporting System. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
All vessels utilised for the Otway Basin 3D MC MSS will demonstrate proactive management of biofouling prior to entering Australian territorial waters by implementing one of the following three accepted proactive biofouling management options: • Implementation of an effective biofouling management plan; • Cleaned all biofouling within 30 days prior to arriving in Australian territory; or • Implementation of an alternative biofouling management method pre-approved by DoCCEEW.	P = Yes E = Effective	This control measure aligns with the Australian Biofouling Management Requirements (Version 1) which provide guidance for vessel operators on best practice measures to avoid the introduction of IMS into Australia. It is a legislative requirement for vessels to comply with the Biosecurity Act 2015.	Yes
Effective anti-fouling systems and management practices are adopted for each vessel that complies with the requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and the requirements of the Protection of the Sea (Harmful Antifouling Systems) Act 2006. Anti-foul systems used on the vessel will not consist of harmful anti-fouling compounds (i.e. an organotin compound that acts as a biocide in an anti-fouling system, or cybutryne) or each harmful anti-fouling compound that is applied on external surfaces has a coating that forms a barrier to the compound leaching into the water, or, for a ship that has cybutryne applied on a designated external surface, neither of the following has occurred; i) the first scheduled renewal of the ships' anti-fouling system after 1 January 2023, ii) the day that is 60 months after the last application of cybutryne to the ship before 1 January 2023.	P = Yes E = Effective	Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and the Protection of the Sea (Harmful Antifouling Systems) Act 2006 prohibit ships from bearing or applying organotin compounds which act as biocides in anti-fouling systems and require vessels to carry a current international anti-fouling system certificate. Anti-foul systems used on the vessel will not consist of harmful anti-fouling compounds (i.e. an organotin compound that acts as a biocide in an anti-fouling system, or cybutryne) or each harmful anti-fouling compound that is applied on external surfaces has a coating that forms a barrier to the compound leaching into the water, or, for a ship that has cybutryne applied on a designated external surface, neither of the following has occurred; i) the first scheduled renewal of the ships' anti-fouling system after 1 January 2023, ii) the day that is 60 months after the last application of cybutryne to the ship before 1 January 2023. Anti-fouling paint systems are one of the primary methods for preventing the establishment and translocation of fouling species. Therefore, having an effective anti-fouling system in place onboard the survey vessels will reduce the potential for IMS to attach to the vessels, and subsequently establish in new areas. Each vessel is to have documented anti-fouling management procedures, involving periodic in-water and/or dry-dock inspections. A current international anti-fouling system certificate will be carried by each vessel associated with the Seismic Survey. It is a legislative requirement for vessels to comply with the Protection of the Sea (Harmful Antifouling Systems) Act 2006.	Yes
Good Industry Practice			
All vessels will have 'clean' hull and niche areas upon arrival with a written report from a qualified marine biologist on the biofouling inspection. A Marine Biofouling Inspector will be contracted in accordance with the requirements set out in **Section 10.3.1** to ensure this.	P = Yes E = Effective	Checking or evidence of recent inspection that the vessel hulls and niche areas are clean prior to arrival within the OA will reduce the likelihood of any IMS travelling with the vessel en-route to the area. Due to this fact, the ability for an IMS to establish itself due to the proposed activities will be reduced to **ALARP**. A Marine Biofouling Inspector will be contracted in accordance with the requirements set out in **Section 10.3.1** to evaluate the risk profile of the survey vessel/s. When assessing the risk profile of the survey vessel/s, the Marine Biofouling Inspector will take into consideration the following (note that this is not an exhaustive list): • The age, type and condition of the vessel and anti-fouling coating;	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
		• Previous biofouling cleaning and inspections that have been undertaken on the vessel/s and the outcomes of these previous inspections; • An assessment of internal niches with potential to harbour IMS and presence and condition of internal seawater treatment systems; • The vessel's history since the last inspection, including the origin of the vessel and its potential for exposure to IMS and subsequent translocation risk; • An assessment of the vessel's Biofouling Management Plan and record book against the IMO Biofouling Guidelines; and • In water specifications where appropriate. Environmental benefit outweighs additional cost.	
Survey equipment to be inspected, cleaned, and dried prior to deployment in the OA or Australian territorial waters.	P = Yes E = Effective	As per the above, checking that equipment proposed to be used for the Seismic Survey is clean prior to use will reduce the potential for IMS to be transferred into the area and ensure the management of these risks are **ALARP**. Environmental benefit outweighs additional cost.	Yes
In compliance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry, a biofouling risk assessment will be completed for each vessel entering Australian territorial seas prior to mobilising to the OA.	P = Yes E = Effective	Biofouling risk assessments show low risk of IMS presence prior to entry into Australian waters. For vessels determined to have a moderate or high risk, the vessel contractor will need to engage a qualified independent third-party marine pest inspector to determine the corrective actions to reduce the vessel IMS risk to low. The vessel contractor must demonstrate to TGS that all corrective actions have been implemented and reassessment of the vessel prior to mobilisation determines the risk to be low. Environmental benefit outweighs additional cost.	Yes
Reporting of sightings or suspicions of any IMS on vessel/s, in niche areas or in ports/harbours.	P = Yes E = Effective	Reporting of any sighted or suspected IMS will allow an effective response to the presence of IMS and reduce the risk of further establishment of that species. Therefore, if an IMS is sighted or suspected, TGS will report by email to: • SA waters: Fishwatch Hotline (1800 065 522); • Agriculture VIC – marine.pests@agriculturevic.gov.au; and • Biosecurity TAS – biosecurity.tasmania@nre.tas.gov.au Notification will include photos of any sighted or suspected IMS. Notification will be provided no later than 24 hours following sighting/suspicion of the IMS. Environmental benefit outweighs additional cost.	Yes
Vessels to maintain a Biofouling Record Book.	P = Yes E = Effective	The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry recommends vessels operators maintain a Biofouling Record Book to record details of all inspections and biofouling management measures undertaken on the vessel. Environmental benefit outweighs additional cost.	Yes
Reassessment of risks in the event of a change to contracted vessels.	P = Yes E = Effective	Under the NOPSEMA Information Paper 'Reducing marine pest biosecurity risks through good practice biofouling management', any change in risk profile because of new information or changes to the offshore activity should trigger a risk review process. If there is a change to the vessels contracted for the Otway Basin 3D MC MSS, a risk review process will be triggered to determine whether new or modified control measures should be adopted. Any new vessel contracted for the Otway Basin 3D MC MSS will comply with the appropriate Control Measures for minimising the risk of IMS. Environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternative/Substitute Controls Considered:			
No discharge of ballast water from vessels during the Otway Basin 3D MC MSS.	P = No Effective = Partly effective	Although ballast water exchange is not expected to occur during routine survey activities, the possibility of needing to discharge ballast water cannot be ruled out completely and exchange and uptake may be required in unexpected circumstances where discharge/exchange is necessary to ensure the safety of persons onboard the vessel. Ballast water will already be managed in accordance with the Australian Ballast Water Management Requirements and as such, the likelihood of introducing IMS via ballast water is highly unlikely. This control measure is not practicable to implement and is disproportionate to any reduction in risk.	No
Additional Control Measures Considered:			
Mandatory dry docking of the Seismic Vessel prior to entering the OA.	P = No E = Effective	Although this control measure would eliminate IMS, the substantial costs associated with this occurring, in addition to the significant delays in the scheduling, make this control measure unsustainable; especially considering the other controls in place are expected to effectively reduce the risks associated with IMS. The cost associated with this measure would outweigh the reduction in risk.	No
Ballast the vessel using only finely filtered water or freshwater.	P = No E = Partly Effective	Ballast water requirements change frequently and supplying the required large volumes of finely filtered seawater, or freshwater is either not possible quickly enough, or would require large redesign of vessel/s to create enough storage. Making freshwater, and/or filtering seawater requires a large amount of energy, decreasing efficiency and sustainability. Therefore, the costs are disproportionate to benefits. Additionally, the allocation of freshwater, which likely has many other beneficial uses, to a commercial industrial application is not sustainable and should be minimised wherever possible. Using 'local' water as ballast provides an effective means of reducing IMS introductions to **ALARP**.	No
Treatment of ballast water, either through heat treatment or chemical dosage.	P = No E = Partly Effective	This control measure would reduce the potential for IMS to establish within the ballast water; however, the high cost involved in completing this control outweighs the reduction in risk, considering the other controls in place already reducing the risks associated with IMS. This type of control also includes detrimental effects to the marine environment, either through additional chemicals being released which are toxic to marine species, or high temperature water being added to the marine environment that may cause death of native marine species.	No
Source Seismic Vessel within Australia.	P = No E = Partly Effective	There is still a risk of an undetected IMS being present on/near the vessel at its Australian Port, as ports and marinas within the coastal nearshore marine environment are highly susceptible to IMS incursion and establishment. Additional time and resources would be required to find and assess suitable vessels within Australia, if any are present and available. Therefore, the costs are disproportionate to benefits.	No
Niche areas and deployed equipment built/redesigned to reduce IMS attachment or stowage.	P = No E = Effective	Design of vessels, niche areas and the seismic equipment make them as efficient as possible at their task. Additional redesign adds significant cost and may decrease the efficiency of equipment for its intended purpose, such as affecting the performance of sensitive equipment. Therefore, costs are disproportionate to benefits.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Risk Ranking**
All receptors (outlined in **Section 8.1.2** and **8.1.3**).	Severe	Remote	Low
ALARP Statement:			
The decision context has been assessed as Type A and the overall residual risk has been determined to Low. TGS considers the adopted control measures minimise the risk of impacts from the introduction of IMS and are appropriate to the localised nature and small scale of the predicted environmental impacts associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements, good industry practice, using professional experience and taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Additional control measures were considered as part of the assessment process; however, it was considered that they did not provide any further environmental benefit or were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from the introduction of IMS are reduced to **ALARP.**			

8.1.6 Impact and Risk Acceptability

Table 108 Demonstration of General Impact and Risk Acceptability for the Introduction of Invasive Marine Species

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to be Low.
Ecologically Sustainable Development	The management of the risks and impacts proposed by TGS associated with the introduction of IMS can be carried out in compliance with the five principles of ecologically sustainable development as defined within the EPBC Act. These principles have been considered as part of the development of this EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term. Therefore, the impact and risks are considered to be consistent with the principles of ESD.
TGS Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	As described in **Section 8.1.2**, the greatest potential for an IMS introduction occurs due the movement and docking of vessels, and transporting material between contrasting sources and receiving environments. With regard to the Otway Basin 3D MC MSS, this would be limited to occurrences when the survey vessels visit ports/harbours at the beginning and conclusion of the campaign (noting that refuelling and re-supply will be conducted at sea). During acquisition of the survey, the vessels will be continually moving in offshore areas which make the potential attachment or translocation of IMS less likely. It is considered that the control measures in place will provide appropriate protection to the existing marine environment, and that the potential for any impacts and associated risks from the introduction of IMS are at an **Acceptable Level**.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the introduction of IMS has been determined to be Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. The South-east Marine Parks Network Management Plan 2013 – 2023 allows for ballast water to be discharged or exchanged, except for within areas characterised as Sanctuary Zone (1A), subject to compliance with: • The Australian Ballast Water Management Requirements and relevant state ballast water management arrangements; • Relevant Commonwealth and state legislation or international agreements (if any) relating to ballast water management; and • Relevant prohibitions, restrictions and determinations made by the Director under the South-east Marine parks Network Management Plan. The control measures that will be implemented during the Otway Basin 3D MC MSS will be in accordance with MARPOL and are therefore consistent with the South-west Marine Parks Network Management Plan 2013 - 2023. Except for the Wildlife Conservation Plan for Seabirds 2022, review and assessment of the species recovery plans, and conservation advice did not identify threats associated with the establishment of IMS for the species of relevance to the OA (**Section 4.5.8**). Control measures that will be implemented for the Otway Basin 3D MC MSS to reduce the risk of IMS focus on the prevention of the introduction of IMS and are therefore consistent with the activities prescribed within the Wildlife Conservation Plan for Seabirds 2022 and species survival will not be compromised.
Social Acceptance – Relevant Persons Expectations	Commercial abalone fishers raised concerns regarding the introduction of fish disease as a result of vessel movements associated with the Otway Basin 3D MC MSS. TGS will implement strict biosecurity control measures to prevent the introduction of IMS, including fish disease. Therefore the environmental impacts relating to IMS and biosecurity during the Otway Basin 3D MC MSS are considered to be at a socially **Acceptable Level.**
External Context – Commonwealth and State Legislative Criteria	The proposed control measures for IMS introduction and establishment during the Otway Basin 3D MC MSS are consistent with the following relevant standards/documents: • Biosecurity Act 2015; • Australian Ballast Water Management Requirements (Version 8); • Australian Biofouling Management Requirements (Version 1); and • Protection of Sea (Harmful Anti-Fouling Systems) Act 2006.
Industry Best Practice	The control measures are based on industry best practice to decrease the risk of IMS introduction/establishment, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations. This manual recommends ballast water management plans need to be in place and followed to ensure IMS are not translocated between regions/countries, including recommendations to regularly exchange ballast water, clean ballast tanks, etc.; • The APPEA Code of Environmental Practice, which recommends that geophysical surveys should have an environmental objective to reduce the risk of IMS introduction to **ALARP** and **Acceptable Levels**, including having evidence of appropriate quarantine management measures; • The National Biofouling Management Guidance for the Petroleum Production and Exploration Industry including the completion of an IMS risk assessment prior to the vessels entering Australian waters and in-water survey equipment being cleaned and dried prior to use in the OA;

Criteria for Acceptance	Acceptability Summary
	• IMO Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species; and • Anti-fouling and In-Water Cleaning Guidelines.
ALARP	Complete elimination of the risk of IMS is not possible as the Otway Basin 3D MC MSS will require the use of vessels and deployed equipment which could be subject to biofouling, and ballast water will be required for each vessel to operate safely and efficiently. Following the implementation of the control measures detailed in this assessment, the residual risks and impacts to the marine environment and associated receptors from establishment of IMS is **Low**. In accordance with the Risk Ranking descriptions, the predicted magnitude of impact is acceptable without further reduction measures being required, the control measures are consistent with good industry practice have been applied and have been assumed in the design process. No further development of control measures is required if ALARP. It is considered that through the implementation of control measures, the potential for impacts and associated risks from the introduction of IMS, as a result of the Otway Basin 3D MC MSS, are at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined Acceptable Levels for that impact or risk, including those described in **Table 52.** Based on the above evaluation, the potential impacts and risk from the introduction of IMS meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of the introduction of IMS on all receptors to an **Acceptable Level.**

8.1.7 Environmental Performance

Table 109 Environmental Performance Outcomes, Standards and Measurement Criteria for Invasive Marine Species

Number	Environmental Performance Outcome	Environmental Performance Standard(s)
EPO 24	No introduction or establishment of any Invasive Marine Species as a result of the Otway Basin 3D MC MSS	**EPS 207** to **EPS 228**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 207**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 208: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Adherence to the Australian Ballast Water Management Requirements (Version 8). Vessels will manage ballast water exchange/discharge using one of the following approved methods of management: • An approved ballast water management system; • Ballast water exchange conducted in an acceptable area (as defined in the Ballast Water Management Requirements (Version8)); • Use of low-risk ballast water (such as fresh potable water, high seas water or fresh water from an on-board fresh water production facility); • Retention of high-risk ballast water on board the vessel; or • Discharge to an approved ballast water reception facility.	**EPS 209**: Survey vessels will be compliant with the Australian Ballast Water Management Requirements (Version 8) by following at least one of the approved methods of management, including: • An approved ballast water management system; • Ballast water exchange conducted in an acceptable area (as defined in the Ballast Water Management Requirements (Version8)); • Use of low-risk ballast water (such as fresh potable water, high seas water or fresh water from an on-board fresh water production facility); • Retention of high-risk ballast water on board the vessel; or • Discharge to an approved ballast water reception facility.	Pre-mobilisation inspection/audit confirms at least one approved method is in place.	VOC TGS VOM Vessel Master Party Chief SEA CSR
	EPS 210: Ballast water discharges must comply with the relevant requirements of the Biosecurity Act 2015 and Australian Ballast Water Management Requirements (Version 8).	All Ballast Water exchanges recorded in Ballast Water Logbook. Biosecurity Clearance attained following Pre-Arrival Report process.	Vessel Master Party Chief SEA
	EPS 211: Internationally sourced ballast water will not be discharged within 12 NM of the nearest land or in water <50 m deep and preferably beyond 200 NM from nearest land in water >200 m deep.		

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
In accordance with the Ballast Water Management Requirements (Version 8), vessels will not exchange ballast water within 12 NM from the nearest land and in water depths of less than 50 m unless sourced from Australian waters.	**EPS 212**: Ballast waters sourced from Australian waters may be discharged within 12 NM of emergent land or in water <50 m deep (including ports/harbours).		CSR
Vessels will have a Ballast Water Management Plan in place and valid Ballast Water Management Certificate (unless an exemption applies or is obtained from (DoCCEEW).	**EPS 213**: A Ballast Water Management Plan will be maintained in accordance with Regulation B-1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments	Pre-mobilisation inspection/audit confirms each vessel holds an approved Ballast Water Management Plan.	Vessel Master Party Chief SEA CSR
	EPS 214: Vessels undertaking the Otway Basin 3D MC MSS will hold valid Ballast Water Management Certificates.	Pre-mobilisation inspection/audit confirms each vessel holds a valid Ballast Water Management Certificate.	VOC Vessel Master Party Chief
All vessels will maintain a complete and accurate Ballast Water Record System that is consistent with the Ballast Water Management Requirements (Version8).	**EPS 215**: A complete and current record of all ballast water movements will be maintained in the Ballast Water Record System to confirm ballast water management is undertaken in accordance with the Australian Ballast Water Management Requirements (Version 8).	Accurate and complete Ballast Water Record System kept onboard the vessel and maintained throughout the Otway Basin 3D MC MSS. Pre-mobilisation inspection/audit confirms each vessel has a Ballast Water Record System consistent with the Ballast Water Management Requirements (Version 8).	Vessel Master Party Chief SEA CSR
Vessels entering Australian territorial waters will obtain all the necessary DAFF biosecurity approvals, prior to mobilisation.	**EPS 216**: Operators of all vessels utilised during the Otway Basin 3D MC MSS will provide information on how biofouling has been managed prior to arriving in Australian territorial seas through the Pre-Arrival Report. Pre-Arrival Report is to be submitted through the DAFF Maritime Arrivals Reporting System between 96 – 12 hours prior to the estimated time of arrival.	Pre-mobilisation inspection/audit confirms each vessel has a copy of Biosecurity Status Document onboard each vessel following Pre-Arrival Report process	VOC Vessel Master SEA CSR
All vessels utilised for the Otway Basin 3D MC MSS will hold a valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate.	**EPS 217**: All vessels utilised during the Otway Basin 3D MC MSS will hold a valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate for the duration of the survey.	Pre-mobilisation inspection/audit confirms each vessel has a copy of valid Ship Sanitation Control Certificate or Ship Sanitation Control Exemption Certificate onboard each vessel	VOC Vessel Master Party Chief
All vessels utilised for the Seismic Survey will demonstrate proactive management of biofouling prior to entering Australian territorial waters by implementing one of the following three accepted proactive biofouling management options: • Implementation of an effective biofouling management plan; • Cleaned all biofouling within 30 days prior to arriving in Australian territory; or • Implementation of an alternative biofouling management method pre-approved by DoCCEEW.	**EPS 218:** As part of the Pre-Arrival Report referenced in **EPS 216**, each vessel will demonstrate proactive management of biofouling in accordance with the Australian Biofouling Management Requirements (Version 1). This can be achieved by implementing one of the following three accepted proactive biofouling management options: • Implementation of an effective biofouling management plan; • Cleaned all biofouling within 30 days prior to arriving in Australian territory; or • Implementation of an alternative biofouling management method pre-approved by DAWE.	Each vessel used for the Otway Basin 3D MC MSS will demonstrate proactive management of biofouling through the Pre-Arrival Report. Pre-mobilisation inspection/audit confirms each vessel proactively manages biofouling by ensuring a copy of Biosecurity Status Document is onboard each vessel following Pre-Arrival Report process.	VOC Vessel Master Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Effective anti-fouling systems and management practices are adopted for each vessel that complies with the requirements of Annex 1 of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and the requirements of the protection of the Sea (Harmful Antifouling Systems) Act 2006. Anti-foul systems used on the vessel will not consist of harmful anti-fouling compounds (i.e. an organotin compound that acts as a biocide in an anti-fouling system, or cybutryne) or each harmful anti-fouling compound that is applied on external surfaces has a coating that forms a barrier to the compound leaching into the water, or, for a ship that has cybutryne applied on a designated external surface, neither of the following has occurred; i) the first scheduled renewal of the ships' anti-fouling system after 1 January 2023, ii) the day that is 60 months after the last application of cybutryne to the ship before 1 January 2023.	**EPS 219**: A current international anti-fouling system certificate will be carried by each vessel associated with the Seismic Survey which shows that the vessel anti-fouling systems are maintained in accordance with the Protection of the Sea (Harmful Anti-fouling Systems) Act 2006 and Anti-fouling and In-Water Cleaning Guidelines which implements the International Convention on the Control of Harmful Anti-fouling Systems on Ships.	Pre-mobilisation inspection/audit confirms the Seismic Vessels are carrying a current International Anti-fouling System Certificate.	VOC Vessel Master Party Chief
	EPS 220: All vessels will comply with the requirements of the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Commonwealth of Australia, 2009) which requires: • Maintenance of biofouling electronic records outlining marine fouling management actions • Completion of an IMS risk assessment prior to vessel entry into Australian waters and which concludes a low risk of IMS presence • In-water equipment free of marine fouling prior to the commencement of the survey	Pre-mobilisation inspection/audit confirms records are available to verify the following has occurred: • Marine fouling management actions are recorded electronically; • An IMS risk assessment has been completed prior to each vessel entry into Australian waters and concludes a low risk of IMS presence; and • In-water equipment is free of marine fouling prior to the commencement of the Otway Basin 3D MC MSS.	VOC Vessel Master Party Chief
All vessels will have 'clean' hull and niche areas upon arrival with a written report from a qualified marine biologist on the biofouling inspection. A Marine Biofouling Inspector will be contracted in accordance with the requirements set out in **Section 10.3.1** to ensure this.	**EPS 221**: Vessel will have had recent dry-docking or IMS hull inspection with appropriate certification and have a written report from a qualified marine biologist on the biofouling inspection.	Pre-mobilisation inspection/audit for IMS inspection certificate, dry-dock and/or anti-fouling application certification and written report from qualified marine biologist on the biofouling inspection.	VOC Vessel Master Party Chief
	EPS 222: A Marine Biofouling Inspector will be contracted in accordance with the requirements set out in **Section 10.3.1** to evaluate the risk profile of the survey vessel/s. When assessing the risk profile of the survey vessel/s, the Marine Biofouling Inspector will take into consideration the following (note that this is not an exhaustive list): • The age, type and condition of the vessel and anti-fouling coating; • Previous biofouling cleaning and inspections that have been undertaken on the vessel/s and the outcomes of these previous inspections; • An assessment of internal niches with potential to harbour IMS and presence and condition of internal seawater treatment systems; • The vessel's history since the last inspection, including the origin of the vessel and its potential for exposure to IMS and subsequent translocation risk; • An assessment of the vessel's Biofouling Management Plan and record book against the IMO Biofouling Guidelines; and • In-water inspections where appropriate.	Pre-mobilisation inspection/audit confirms a Marine Biofouling Inspector has been contracted for a biofouling assessment on vessels entering Australian territorial waters. Pre-mobilisation inspection/audit confirms documentation of biofouling assessment carried out on vessels entering Australian territorial waters.	VOC Vessel Master Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Survey equipment to be inspected, cleaned, and dried prior to deployment in the OA or Australian territorial waters.	**EPS 223**: All equipment deployed from vessel (e.g. streamers, birds, tail-floats, etc.) must be thoroughly cleaned, and then dried for at least 24 hours prior to being deployed in the OA or Australian territorial waters for the first time. This is consistent with the requirements of the National Biofouling Guidelines for the Petroleum Production and Exploration Industry.	Equipment maintenance records confirm that in-water equipment is free of marine fouling prior to survey commencement. Onboard records of equipment maintenance and cleaning.	Vessel Master Party Chief
In compliance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry, a biofouling risk assessment will be completed for each vessel entering Australian territorial seas prior to mobilising to the OA.	**EPS 224**: Biofouling risk assessment is completed for each vessel before entering Australian territorial seas prior to mobilising to the OA.	IMS risk assessment has been completed prior to the vessel's entry into Australia and the risk has been determined as low.	TGS VOM VOC Vessel Master
Reporting of sightings or suspicions of any IMS on vessel/s, in niche areas or in ports/harbours.	**EPS 225**: Suspected or confirmed presence of any marine pests or disease must be reported to authorities within 24 hours of sighting, including photos of the suspected or confirmed marine pests or disease. Reports are to be provided to: • South Australia: Fishwatch Hotline (1800 065 522); • Agriculture VIC – marine.pests@agriculturevic.gov.au; and • Biosecurity TAS – biosecurity.tasmania@nre.tas.gov.au	Incident reporting form identifying sighting or suspicion of any IMS. Records of communication show report of suspected or confirmed presence within 24 hours by email or telephone.	Vessel Master. Party Chief. General Vessel Crew.
Vessels to maintain a Biofouling Record Book.	**EPS 226**: Each survey vessel shall maintain a Biofouling Record Book detailing all inspections and biofouling management measures undertaken on that vessel.	Biofouling Record Book maintained on each vessel. Pre-mobilisation inspection/audit confirms Biofouling Record Book is in place	Vessel Master Party Chief SEA CSR
	EPS 227: Biofouling Record Book will follow the format provided in Appendix B of the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry.	Biofouling Record Book maintained on each vessel. Pre-mobilisation inspection/audit confirms Biofouling Record Book is in place	Vessel Master Party Chief SEA CSR
Reassessment of risks in the event of a change to contracted vessels.	**EPS 228**: A risk assessment will be carried out as per the Management of Change process in the event that there is a change in vessels part way through the Otway Basin 3D MC MSS.	Management of Change records show changed contracted vessel complies with biosecurity requirements listed in the EPSs above.	Vessel Master SEA CSR TGS VOM

8.1.8 Introduction of Invasive Marine Species Impact and Risk Summary

Based on the assessment above, including the identification of potential impacts on the environment and the associated controls measures to be implemented, the residual risk of the introduction/establishment of an IMS from the Otway Basin 3D MC MSS is considered to be **Low**.

The suite of control measures to be implemented have been developed in accordance with industry best practice, and all relevant legislation. Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from the introduction/establishment of an IMS from the Otway Basin 3D MC MSS Survey, are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4,** the suite of control measures is considered appropriate to manage the risks and impacts arising from the introduction/establishment of an IMS from the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level.**

8.2 Streamer Loss

8.2.1 Description of Source of the Impacts and Risks

There are a number of ways in which potential damage to and resultant loss of streamers could occur; these include snagging with floating debris, rupture from abrasions or shark bites, loss from severance during a collision (e.g. if another vessel were to accidentally cross the streamer), or a failure of lifting equipment. Solid streamers, such as those proposed to be used during the Otway Basin 3D MC MSS, are negatively buoyant and would sink if severed.

Impacts associated with the accidental loss of solid wastes (hazardous or non-hazardous) are assessed in **Section 8.5.**

8.2.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 110**.

Table 110 Environmental Receptors Assessed

Receptor	Section reference
Benthic habitats (banks, shoals and reefs)	**Section 8.2.2**
Benthic invertebrates	

Direct contact between the streamer and the seabed due to damage or loss would result in physical damage to the benthic habitat and any sensitive communities in the area. Should this equipment be irretrievably lost and persist on the seabed as debris, it has the potential to entangle with marine fauna or fishing equipment.

The OA is expected to be sparsely covered by macroalgae, sessile filter feeders, mobile macroinvertebrates and bioturbating infauna (Hosack and Dambacher, 2012; Williams *et al*., 2009). Several areas overlap the OA that support a high diversity of benthic assemblages, namely the Apollo and Zeehan AMPs (**Section 4.4.1** and the West Tasmanian Canyons KEF (**Section 4.4.3**). While it is possible that a lost streamer could cause physical damage to sensitive benthic communities within these areas and the wider OA, the control measures implemented throughout the duration of the Otway Basin 3D MC MSS will reduce the risk of equipment loss and subsequent environmental impact and ensure that the integrity of sensitive receptors (including AMPs and KEFs) will be maintained throughout the survey. Given the size of equipment used for the survey, only a relatively small area of the seabed would be disturbed, and lasting impacts are not expected.

Various control measures will be implemented during the Otway Basin 3D MC MSS (**Table 113**), including, but not limited to, the utilisation of solid streamers, integration of self-recovery devices and recording real-time positioning of the streamers, all of which are implemented to prevent the loss of streamer should it break free and stop it from reaching the seabed.

The 'streamer recovery devices' are pressure activated self-inflating buoys, that activate if a streamer is severed and sinks to a certain depth. This system provides sufficient positive buoyancy to return the damaged streamer to the sea surface, enabling recovery by the Support Vessel. Only solid streamers will be used during the Otway Basin 3D MC MSS. In contrast to oil-filled streamers and other alternatives, solid streamers do not contain fluids which could leak into the marine environment following damage or loss.

In the unlikely event that a streamer does contact the seabed, it is useful to note that areas of archaeological interest or cultural significance are typically associated with intertidal and shallow subtidal environments of the nearshore and costal marine environment. The nature of the OA, which is located offshore, affords low potential for impacts on such values. Additionally, it is considered that should the control measures fail, and a streamer is lost to the seabed, it would sink relatively quickly, before travelling any great distance. Therefore, if a streamer reached the seabed, it would be unlikely to drift beyond the boundary of the OA.

The residual risk to environmental receptors arising from the use of streamers during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Remote*).

8.2.3 Evaluation of Known and Potential Impacts and Risks to Other Marine Users

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 111**.

Table 111 Relevant Persons and Other Marine Users Assessed

Receptor	Section reference
Commercial Fisheries	**Section 8.2.3**
Shipping	
Oil and Gas Activities	
Submarine Cables	
Defence Activities	

In the unlikely event that equipment is lost, other marine users of the OA may be required to make minor diversions to avoid the equipment, until it can be retrieved (if possible). The potential for such interactions will be limited to a short period of time while the equipment is retrieved. Should disruption occur it is only expected to affect individual users and cause temporary disruption through avoidance of a highly localised area. Given the nature and size of the equipment to be used during the Otway Basin 3D MC MSS, lost equipment may result in a minor navigational hazard.

The residual risk to relevant persons and other marine users arising from the use of streamers during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Remote*).

8.2.4 Decision Context

The decision context for streamer loss has been assessed as Type A given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

8.2.5 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

The control measures that have been considered during the Otway Basin 3D MC MSS to manage any potential impacts from the loss of a seismic streamer to **ALARP** have been included in **Table 113**. TGS has considered a number of control measures to assess the benefits of their implementation towards risk reduction (**Table 113**), based on a Hierarchy of Controls methodology (**Table 112**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 112 Hierarchy of Control Measures for Streamer Loss

Eliminate	The survey cannot be conducted without the use of streamers.
Substitute	There are no practicable substitutes for using streamers on the Seismic Vessel.
Reduce	Streamer recovery devices will float a lost/broken streamer, or section of streamer, to facilitate recovery by either of the survey vessels before it can make contact with the seabed. The streamer and associated towing equipment will be inspected and maintained for wear-and-tear and any worn or 'tired' parts replaced.
Mitigate	Control measures have been assessed within **Table 113** in order to mitigate the impacts from loss of a streamer to **ALARP** levels. Those which are appropriate and are not impracticable or unfeasible due to disproportionately large costs will be implemented during the Otway Basin 3D MC MSS.

Table 113 Assessment of Control Measures for Streamer Loss

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of streamer loss.	Yes
Good Industry Practice:			
Solid streamers will be utilised for the Otway Basin 3D MC MSS and fitted with the following equipment: • Self-inflating streamer recovery devices (**SRD**s); • Depth control 'birds'; • Surface marker buoys; • Secondary retaining devices; and • Tail buoys.	P = Yes E = Effective	The utilisation of solid streamers which contain no fluids eliminates the risk that release of hazardous substances into the marine environment following damage or loss. SRDs will be fitted at nominated intervals along the streamer and programmed to automatically deploy at water depths that are shallower than the depth of the ocean where seismic data acquisition is occurring. Under typical conditions, this will allow a damaged and/or severed streamer to return to the sea surface, and be retrieved, before impacting the seabed. Depth control birds will allow the Seismic Vessel to control the depth of the streamers. This will ensure streamers do not sink too low in the water column and potentially impact the seabed, or migrate too deep and activate streamer recovery devices, which could add additional strain on the streamer while underway and making way. Environmental benefit outweighs additional cost.	Yes
Use of redundant attachment points to Seismic Vessel.	P = Yes E = Effective	Streamers will be attached to the Seismic Vessel via the main attachment point as well as a redundant attachment point. Redundant attachment points are a secondary attachment point that act as back-up in the event that the primary attachment point fails. Good industry practice, environmental benefit outweighs additional cost.	Yes
At least one Support Vessel will accompany the Seismic Vessel at all times and, if necessary and safe to do so, will assist in the recovery of lost equipment.	P = Yes E = Effective	At least one Support Vessel will accompany the Seismic Vessel for the duration of the Otway Basin 3D MC MSS. The aim of this vessel is to intercept any other marine users that may interact with the Seismic Vessel and towed equipment, identify and remove any fishing equipment that may be in the path of the Seismic Vessel, and be involved in the retrieval of lost equipment if required and safe to do so. Lost equipment will be located and recovered where safe and practicable to do so, in accordance with the Vessel Contractor's Non-Routine Equipment Recovery Procedures. Good industry practice, safety benefit outweighs additional cost.	Yes
Real time positioning of streamers.	P = Yes E = Effective	The exact position of the streamers will be monitored at all times utilising Intrinsic Ranging by Modulated Acoustics, allowing their positions to be seen relative to any potential hazards. Environmental benefit outweighs additional cost.	Yes
Adherence to vessel Standard Operation Procedure (**SOP**) for streamer deployment and retrieval at all times.	P = Yes E = Effective	All crew will be suitably familiar with and adhere to SOP documents relating to the preparation, deployment, operation and recovery of the seismic equipment to reduce risk of streamer damage and potential loss. SOPs also ensure that deployment and retrieval is undertaken in a safe and consistent manner. Environmental benefit outweighs additional cost.	Yes
All lifting gear used for deployment and retrieval of equipment over the vessel is load rated for the working load.	P = Yes E = Effective	All lifting gear used for the deployment and retrieval of equipment over the vessel will be load rated for the working load to ensure equipment is capable of lifting the loads required and minimise the risk of equipment failing. Environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Inspections and maintenance of streamers and associated equipment.	P = Yes E = Effective	Inspections and maintenance of streamers and associated equipment (e.g. cables and attachment points) ensures that any 'wear-and-tear' is identified and fixed, reducing the potential for the breaking (and subsequent loss) of equipment. All in-sea equipment will be electronically monitored for performance and integrity during the course of the survey. Visual inspections will be carried out on any occasion the equipment is deployed or retrieved. Preventative maintenance will be carried out as per the vessels' Preventative Maintenance System. Environmental benefit outweighs additional cost.	Yes
Reporting of all incidents of lost equipment. AMSA JRCC, and other marine users in the EP Area, will be notified in the event of equipment loss.	P = Yes E = Effective	The recording and reporting of incidents, including those associated with lost equipment is standard in the industry. AMSA JRCC and other marine users of the OA will be notified in the event of equipment loss. Environmental benefit outweighs additional cost.	Yes
Alternatives/Substitutes Controls Considered:			
Alternative data acquisition method.	P = No E = Effective	The Otway Basin 3D MC MSS cannot acquire seismic data without the use of streamers and its associated equipment. Implementation of this control measure would render the survey inoperable.	No
Additional Control Measures Considered:			
Laying the streamers on the sea floor, also known as ocean bottom cable, as opposed to towing the streamers.	P = No E = Effective	Using this methodology for the Otway Basin 3D MC MSS would effectively eliminate the risk associated with the potential loss of a streamer, but it still requires an acoustic source to be towed behind a Seismic Vessel. Deploying the recording array on the seabed takes significantly more time and will introduce additional costs and extended timeframes. It will also cause temporary disturbance to the seabed. The costs would be prohibitively expensive and impracticable for a survey of this size. The proposed methodology is the most efficient way of conducting the survey in the shortest amount of time and will reduce the time that the Seismic Vessel is in the area.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Risk Ranking**
Benthic habitats (banks, shoals and reefs)	Minor	Remote	Low
Benthic invertebrates	Minor	Remote	Low
Commercial fisheries	Minor	Remote	Low
Shipping	Minor	Remote	Low
Oil and gas activities	Minor	Remote	Low
Submarine cables	Minor	Remote	Low
Defence activities	Minor	Remote	Low
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to Low. TGS considers the adopted control measures minimise the risk of impacts from streamer loss and are appropriate to the localised nature and small scale of the predicted environmental impacts associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with good industry practice, using professional experience and taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Additional control measures were considered as part of the assessment process; however, it was considered that they did not provide any further environmental benefit or were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from streamer loss are reduced to **ALARP.**			

8.2.6 Impact and Risk Acceptability

Table 114 Demonstration of General Impact and Risk Acceptability for Streamer Loss

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to be Low.
Ecologically Sustainable Development	The management of the risk associated with streamer loss can be carried out in compliance with the five principles of ESD as defined within the EPBC Act. These principles have been considered as part of the development of this EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS Internal Context	The proposed management of the risks of streamer loss and its associated impacts will be informed by TGS's Non-Routine Equipment Recovery Procedures and Environmental and QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner
Existing Environmental Context	Of relevance, are the maintenance of management objectives and values for protected areas such as the Zeehan and Nelson AMPs and the West Tasmanian Canyons KEF which overlap OA. While it is possible that a lost streamer reaching the seabed could cause physical damage to benthic habitats and communities comprising the KEF and AMPs, the implementation of the proposed control measures ensure that the risks and potential impacts associated with the loss of a streamer do not impede the maintenance of management objective or values for protected areas. As a result, the risks and potential impacts associated with the loss of a streamer to these sensitivities is considered Low. It is considered that the proposed control measures provide appropriate protection to the existing marine environment from the risk of a lost streamer and that any associated effects (e.g. physical seabed damage) are at an **Acceptable Level**.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of streamer loss has been determined to be Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. **Section 4.5.8** provides an outline of the EPBC Act Conservation Management Plans, Recovery Plans and Conservation Advice relevant to the Otway Basin 3D MC MSS. Within these documents, the risk of marine debris impacting those relevant species is highlighted, with the actions required including supporting the implementation of the EPBC Act in accordance with the *Threat Abatement Plan for the impacts of marine debris on vertebrate marine life* (Commonwealth of Australia, 2018). TGS has reduced and, where possible, eliminated any adverse impacts of marine debris from the activities of the Otway Basin 3D MC MSS on turtles, cetaceans, sharks, and birds, noting the linkages with the *Threat Abatement Plan for the impacts of marine debris on vertebrate marine life.* While the OA overlaps the Zeehan and Nelson AMPs, management of loss of equipment will be consistent with the management prescriptions of the AMPs, Special Purpose Zones, and Multiple Use Zones. No impacts are predicted to occur to the natural , cultural, and socio-economic values of the AMPs. The NOPSEMA guidance note for petroleum activities and Australian Marine Parks (NOPSEMA guidance note N-04750-GN 1785 A620236) requires that an EP is developed for undertaking activities such as MSSs. The EP evaluates how environmental impacts and risks will be of an **Acceptable Level** and reduced to **ALARP** and demonstrates that the Seismic Survey will not be inconsistent with the relevant marine park management plan. Operations within the park must ensure the long-term maintenance of biodiversity and other natural values within the reserve. Although the OA is not located within any AMP, the proposed control measures in place to reduce the risk of streamer loss and subsequent environmental impact to adjacent AMP and will ensure that the integrity of the IUCN reserve management principles will be maintained throughout the survey.
Social Acceptance – Relevant Person Expectations	No concerns were raised in regard to possible impacts associated with the loss of a streamer, and as such no additional control/mitigation measures were expected or put in place as a result. The environmental impacts relating to the loss of a streamer from the Otway Basin 3D MC MSS are considered to be at a socially **Acceptable Level**.
External Context – Commonwealth and State Legislative Criteria	There are no relevant legislative requirements identified for the management of the risks and impacts from the potential loss of equipment (i.e. a streamer).
Industry Best Practice	The control measures to decrease the risk of streamer loss follow industry best practice and best practice guidelines and include: • The IAGC Environmental Manual for Worldwide Geophysical Operations, which recommends that operators: - Document and communicate their contingency plans for retrieving any equipment to help mitigate environmental impacts associated with the loss of that equipment; - Notify appropriate regulatory agencies in event of equipment loss; and - Make a reasonable effort to retrieve lost equipment as soon as possible after loss occurs. • The APPEA Code of Environmental Practice, which recommends that geophysical surveys should have an environmental objective to reduce the impacts from loss of equipment to **ALARP** and **Acceptable Levels**, including having evidence of appropriate management procedures and an emergency response plan.
ALARP	Streamers must be towed behind the Seismic Vessel during the Otway Basin 3C MD MSS, therefore total elimination of all impact associated with a streamer loss cannot be achieved. There are also no practicable alternatives. Following the implementation of control measures, the potential impacts to the marine environment and associated receptors from a loss of streamer are likely to be highly localised and short-term. Based on the assessment provided within this EP, the residual impact and risk of the loss of a streamer from the Otway Basin 3D MS MSS is considered to be **Low** and to **ALARP**. Therefore, the potential impact and risk from a lost streamer during the Otway Basin 3D MC MSS is considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined Acceptable Levels for that impact or risk, including those described in **Table 52.** Based on the above evaluation, the potential impacts from streamer loss meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of streamer loss to an **Acceptable Level.**

8.2.7 Environmental Performance

Table 115 Environmental Performance Outcomes Standards and Measurement Criteria for Streamer Loss

Number	Environmental Performance Outcome	Environmental Performance Standard(s)
EPO 25	No loss of equipment to the marine environment.	**EPS 229** to **EPS 243**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 229**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 230: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Solid streamers will be utilised for the Otway Basin 3D MC MSS and fitted with the following equipment: • SRDs; • Depth control 'birds'; • Surface marker buoys; • Secondary retaining devices; and • Tail buoys.	**EPS 231**: The Otway Basin 3D MC MSS will be carried out using solid streamers.	Pre-mobilisation audit and inspection confirms solid streamers are to be used.	Party Chief Seismic Operators Technicians SEA CSR
	EPS 232: The streamers will be fitted with Pressure Activated SRDs at intervals along its length.	Pre-mobilisation audit and inspection confirms presence and operative capability of Pressure Activated SRDs.	Party Chief Seismic Operators Technicians SEA CSR
	EPS 233: The streamer will be fitted with depth control birds to control streamer depth, with depth maintained at between 10 and 30 m.	Pre-mobilisation audit and inspection confirms presence and capability of 'birds'. Bridge logs record tow depth of the streamers.	Party Chief Seismic Operators Technicians SEA CSR
Use of redundant attachment points to Seismic Vessel.	**EPS 234**: Streamers will be attached to the Seismic Vessel via a primary attachment point and secondary redundant attachment point.	Pre-mobilisation audit and inspection confirms presence of redundant attachment points.	Party Chief Seismic Operators Technicians SEA CSR
At least one Support Vessel will accompany the Seismic Vessel at all times and, if necessary and safe to do so, will assist in the recovery of lost equipment.	**EPS 235**: At least one Support Vessel will be present around the Seismic Vessel at all times and will act to intercept marine users, identify and remove fishing equipment in the path of the Seismic Vessel, and retrieve equipment in the event that a loss occurs.	Bridge logs and vessel incident report/record	Vessel Master VOC SEA CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Real time positioning of streamers.	**EPS 236**: Intrinsic ranging by modulated acoustics (**irMA**) will be utilised for the real time positioning of the streamers.	Bridge logs and irMA data shows streamer positions.	Seismic Operators Technicians
Adherence to vessel SOP's for streamer deployment and retrieval.	**EPS 237**: Survey equipment will be prepared, deployed, used and retrieved in accordance with relevant vessel SOPs for each equipment type.	Audit/inspection records and maintenance logs show checks have been completed and operating checklists in the SOP are filled and signed.	Seismic Operators Technicians Party Chief
All lifting gear used for deployment and retrieval of equipment over the vessel is load rated for the working load.	**EPS 238**: All lifting gear used for deployment and retrieval of equipment over the vessel is load rated for the working load.	Inspection records confirm lifting equipment is fit-for-purpose.	Vessel Master Party Chief SEA CSR
Inspections and maintenance of streamers and associated equipment.	**EPS 239**: All in-sea equipment will be electronically monitored for performance and integrity during the course of the survey. Visual inspections will be carried out on any occasion the equipment is deployed or retrieved. Preventative maintenance will be carried out as per the vessels' Preventative Maintenance System.	Inspection records confirm equipment is fit-for-purpose and records any maintenance work that is required/carried out. Audit/inspection confirms Preventative Maintenance System in place on vessel.	Seismic Operators Technicians
Reporting of all incidents of lost equipment. AMSA JRCC, and other marine users in the EP Area, will be notified in the event of equipment loss.	**EPS 240**: Loss of streamer and associated equipment (including in the event that lost equipment is successfully retrieved) will be recorded in an incident report.	Incident report/record shows the loss of the streamer and if the equipment is successfully retrieved.	Vessel Master Party Chief SEA CSR
	EPS 241: If the streamer cannot be retrieved, all relevant persons will be notified as soon as practicable through the communication pathways that will be in place. Communications will include GPS coordinates and all other relevant information.	Incident report/record shows the loss of the streamer and communications sent to relevant persons on the location of the equipment.	Vessel Master Party Chief SEA CSR EA
	EPS 242: AMSA will be notified of any lost equipment as soon as practicable, as a potential navigation hazard.	Incident report/record shows the loss of the streamer and communications sent to AMSA on the location of the equipment.	EA
	EPS 243: Any complaints received regarding loss of equipment will be recorded in a complaint register.	Complaints register will outline any complaints received.	TGS VOM

8.2.8 Streamer Loss Impact and Risk Summary

Based on the discussions above, including the potential impacts on the environment and the associated controls measures to be implemented, the residual risk of the loss of a streamer from the Seismic Vessel is considered to be **Low**.

The suite of control measures to be implemented have been developed in accordance with industry best practice. Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from streamer loss during the Otway Basin 3D MC MSS, are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4,** the suite of control measures is considered appropriate to manage the risks and impacts arising from the loss of a streamer during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

8.3 Vessel Collision, Sinking, and Bunkering and Associated Hydrocarbon Spills

8.3.1 Description of Source of the Impacts and Risks

In 2011, AMSA commissioned a study to estimate the risk of pollution from marine oil spills in Australian ports and waters (DNV, 2011). Part of this study assessed the breakdown of spills by accident type as a frequency per year; this assessment found that spill frequencies are dominated by drift grounding (21.6%), transfer spill (19.9%) and powered grounding (19.1%); whereas the frequency of a collision causing a spill is 11.6%.

The Seismic Vessel will be operating in deep offshore waters, with the vast majority of the survey lines being in waters 100 – 5,000 m, or beyond the shelf edge. As outlined in **Section 3.5.5**, bunkering of the survey vessels will be undertaken at sea. Whilst this activity is recognised as a potential source of risk for a hydrocarbon spill during the Otway Basin 3D MC MSS, the control measures and mitigating factors ensure that this risk, and magnitude of potential adverse effects, are small and any effects are restricted to well within the footprint of the OA. Given it is a source of risk, however, this is assessed alongside the risk of vessel collision for the purpose of this EP. The most catastrophic and hence 'worst-case' scenario for a spill occurrence is that associated with a vessel collision/sinking.

A collision between the survey vessels and another vessel (e.g. passing merchant vessels, fishing vessels, passenger vessels, etc.) has the potential to cause widespread environmental impacts. The most significant potential environmental impact associated with vessel collision is related to the vessel/s sinking and making contact with the sea floor, or damage to the vessel/s and associated release of on-board hazardous substances, specifically the oil, fuel and lubricants, and the effects of these substances on the marine and coastal environment. A surface release of hydrocarbons from a vessel collision or sinking has the potential to result in ecological impacts on various environmental receptors through surface, dissolved and entrained hydrocarbon exposure.

The very worst-case scenario for a hydrocarbon spill would likely arise where the entire contents of either of the survey vessel's fuel tanks were released into the surrounding ocean. However, compartmentalised fuel storage systems will be on the vessels to be utilised during the Otway Basin 3D MC MSS, which effectively reduce the volume of a spill that could occur if the vessel was damaged. In addition, onboard emergency procedures include transferring contents of a ruptured tank into other tanks, where possible.

A collision at sea is unlikely due to routine seagoing procedures undertaken by the crew and master (in accordance with COLREGs), the slow speeds at which the survey vessels will be operating (4 – 5 knots), notifications issued to other marine users (i.e. Notice to Mariners), as well as state of the art navigational systems (i.e. transmitting and receiving AIS and radar) which are typically found on Seismic Vessels, and which support the seismic data acquisition.

For bunkering of marine diesel between the Support Vessel/s and the Seismic Vessel within the OA, two scenarios for a hydrocarbon spill include:

- Loss of containment of marine diesel during bunkering operations, such as a partial or total failure of a bulk transfer hose or fittings during bunkering. This failure may be caused by mechanical stress/integrity issues that could spill marine diesel to the deck and/or into the marine environment. This is estimated to be in the order of less than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume); and

- Partial or total failure of a bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shutoff fuel pumps, for a period of up to five minutes, resulting in approximately 8 m^3 marine diesel loss to the deck and/or into the marine environment.

8.3.2 Oil Spill Trajectory Modelling

TGS has commissioned an assessment of the oceanic dispersal and beaching potential in the unlikely event of a spill resulting from vessel collision during the Otway Basin 3D MC MSS (RPS 2023, see full report in **Appendix C**). In the assessment, a stochastic approach has been adopted to define the statistical probabilities related to oil trajectory, dispersion, diffusion, weathering, and beaching patterns. This was achieved by simulating the occurrence of 100 realistic spill events of MDO from five locations within the OA, randomly distributed over the previous decade with a continuous release of 1,066 m^3 of MDO over six hours at sea level.

For this EP, the scenario of a hydrocarbon spill associated with bunkering was not included in the modelling outputs, however information from other EPs is presented to provide an indication of the likely extent of effects that could occur from such spills. The relatively small volume of any spill associated with a bunkering operation is small by comparison to the worst-case scenarios adopted for the trajectory modelling for vessel collision. Any spill associated with bunkering would be small, contained within the OA, and based on the fate and transport of MDO in the offshore environment, effects would be very localised around the site of the spill and would not persist for very long.

8.3.2.1 Methodology

Spill modelling was conducted at five release locations, which were selected based on their proximity to shorelines and sensitive receptors (**Figure 85**, see **Appendix C** for full report). Release Location 1 is 40 km from the nearest shoreline, Release Location 2 ~38 km, Release Location 3 ~58 km, Release Location 4 ~53 km, and Release Location 5 ~52 km.

Modelling of the trajectory and fate of oil was performed using the Spill Impact Mapping and Assessment Programme (**SIMAP**). This model is designed to simulate the transport and weathering processes that affect the outcomes of hydrocarbon spills to the sea, accounting for the specific oil type, spill scenario, and prevailing wind and current circulation patterns. The SIMAP model calculates two components as follows:

- The transport, spreading, entrainment, evaporation, and decay of surface oil slicks; and
- The entrained and dissolved hydrocarbons released from the slicks into the water column.

Physico-chemical characteristics of the selected oil type detailing the input specifications include the density, viscosity, pour point, distillation curve (volume lost versus temperature) and the aromatic/aliphatic component ratios within given boiling point ranges.

The fuel for the Seismic Vessel will be MDO, which compared with marine gas oil, has lesser environmental persistence following a spill event. Despite its lower persistence, a conservative approach has been retained for the study.

MDO has specific and well documented characteristics which influence its persistence in the marine environment after a spill event; overall it is classified as a Group II, Light persistent Oil. Physical characteristics are described as:

- Density of 829.1 kg/m3 at 15°C
- Dynamic viscosity of 4.0 cP at 25°C,

- Pour Point -14°C;
- High percentage (95%) volatiles (will evaporate when on the sea surface);
- Contains 5% persistent hydrocarbons (do not evaporate or breakdown over time); and
- Relatively high natural dispersion in breaking wave conditions and poor natural dispersion in non-breaking wave (swell) conditions.

The characteristics of MDO is that oil will quickly disperse under wave action but tends to persist as a surface slick during calm weather. On the sea surface, strong winds will increase the rate of evaporation, while the wave conditions associated with these winds also act to mix and disperse the oil into the upper layers of the ocean. Consequently, the day-to-day weather conditions strongly influence the mass budget of MDO throughout the simulations.

The SIMAP trajectory model separately calculates the movement and distribution of the hydrocarbon by mass into the following components:

- Surface-bound or floating oil;
- Entrained oil (non-dissolved oil droplets that are physically entrained by wave action);
- Dissolved hydrocarbons (principally the aromatic and short-chained aliphatic compounds);
- Evaporated hydrocarbons;
- Sedimented hydrocarbons; and
- Decayed hydrocarbons.

The model calculates the transport of surface slicks from the combined forces exerted by surface currents and wind acting on the oil. Transport of entrained oil (oil that is below the water surface) is calculated using the currents only.

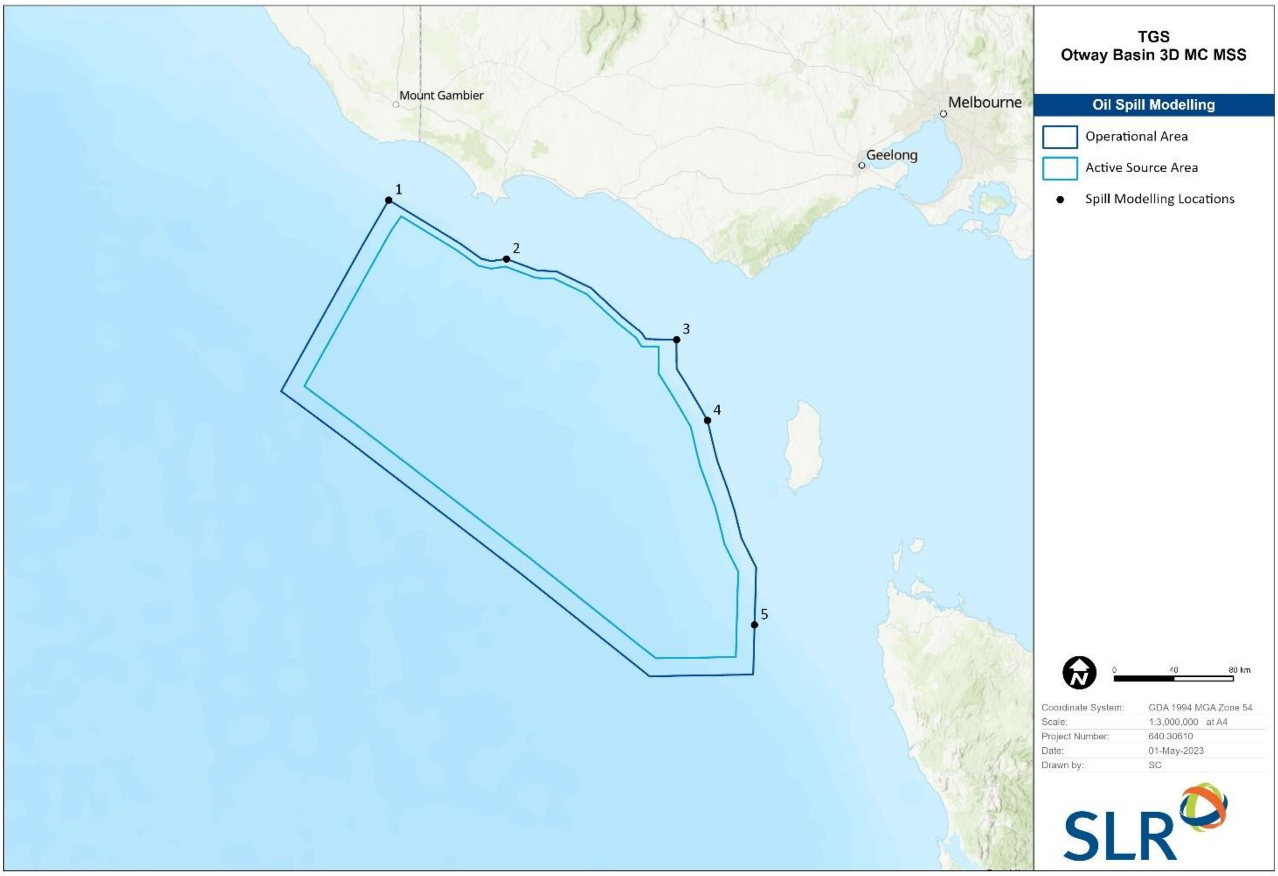
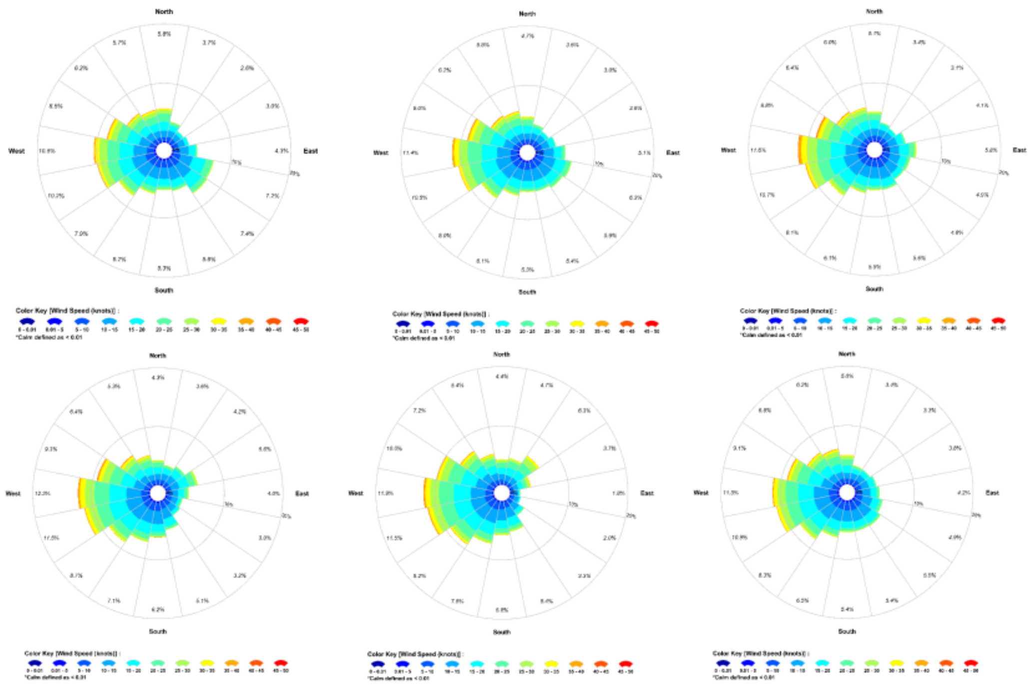


Figure 85 Position of the Five Spill Release Locations (1-5) Chosen Within the Otway Basin OA

The simulated spill scenario was a surface release of 1,066 m^3 of MDO over a six-hour period. Each spill was tracked by the model for 50 days, and the results used to form a database of 100 events (per release location, 500 in total) which were analysed to derive statistics on the fate and mass budgets, plus the probability of occurrence for specific impacts. The SIMAP includes algorithms to account for both physical transport and weathering processes, and for each simulation, records the location (by latitude, longitude and depth) of each of the oil mass units represented in the model. Thus, the simulation framework allows for the weathering dispersal and trajectory of the spill for a maximum exposure of hydrocarbons on the surface, entrained at water depths of 0 – 10 m and 10 – 20 m, dissolved in depths of 0 – 10 m and beaching to be modelled.

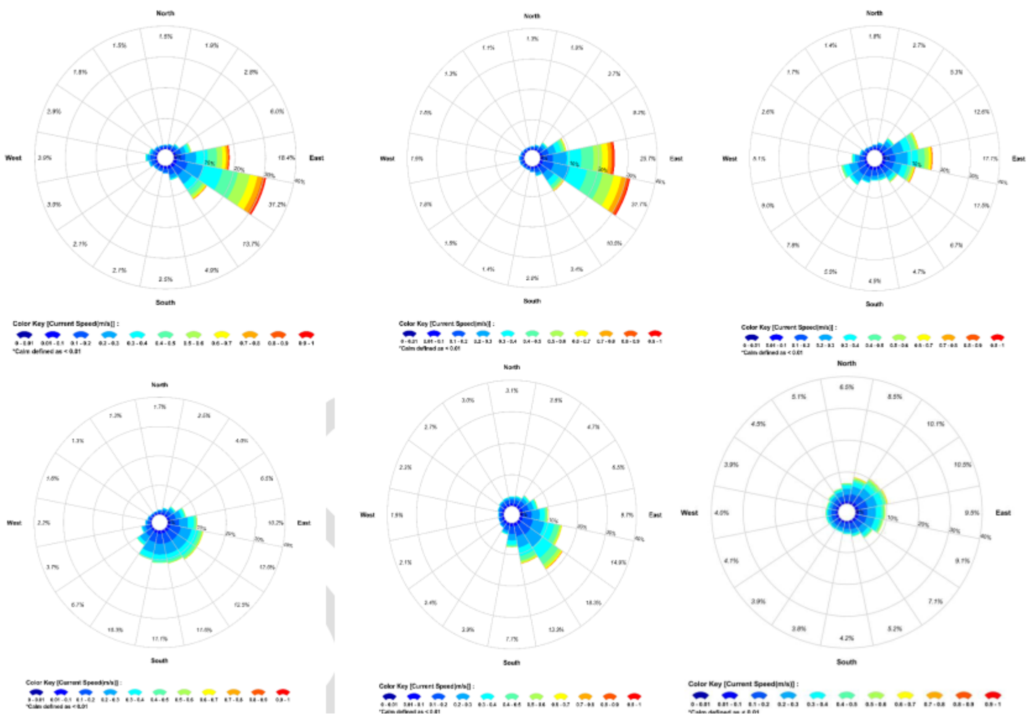
Records of historical hindcasts of the wind and ocean current conditions from 2010 – 2019 (inclusive) were used to drive the numerical model. Rose plots for the seasonal and annual conditions for winds and surface currents are presented in **Figure 86** and **Figure 87**. Modelling was conducted at any time of year to ensure weather and hydrodynamic conditions provide the worst-case extent of the hydrocarbon release scenario, ensuring conservatism in the modelling.



Source: RPS, 2023.

Note: The wind directional convention is 'coming from'.

Figure 86 Total Wind Roses for Release Locations 1 (upper left), 2 (upper centre), 3 (upper right), 4 (lower left), 5 (lower centre) and within the OA (lower right), Based on Hindcast Data 2010-2019 (inclusive)



Source: RPS, 2023

Note: The current directional convention is 'coming from'. Derived from large-scale ocean current and nearshore tidal current data 2010-2019 (inclusive)

Figure 87 Annual Surface Current Rose Plots for Release Locations 1 (upper left), 2 (upper centre), 3 (upper right), 4 (lower left), 5 (lower centre) and Within the OA (lower right)

8.3.2.2 Exposure Values

The outputs of the hydrocarbon spill modelling are used to assess the environmental risk, if a credible hydrocarbon spill scenario occurred, by defining which areas of the marine environment could be exposed to hydrocarbon levels exceeding exposure values that may result in impact to sensitive receptors. Different exposure levels therefore influence the exposure type, and therefore the assessment of risk as follows:

- Surface hydrocarbon exposure levels, to assess physical effects on sensitive receptors offshore;
- Shoreline accumulation levels, to assess physical effects on sensitive receptors onshore; and
- Water column exposure levels, to assess toxicity effects to sensitive receptors offshore from entrained and dissolved aromatic hydrocarbons.

The degree of impact will depend on the sensitivity of the biota contacted, the duration of the contact (exposure) and the toxicity of the hydrocarbon mixture making the contact. The toxicity of a hydrocarbon will change over time, due to weathering processes altering the composition of the hydrocarbon.

The modelling considered four key physical or chemical phases of hydrocarbons that pose differing environmental and socio-economic risks: surface, entrained, dissolved and shoreline accumulated hydrocarbons. The modelling used pre-defined hydrocarbon exposure values, which have been identified as relevant for risk assessment and oil spill planning, for the various hydrocarbon phases. The pre-defined exposure values are listed in **Table 116**. These are based on the instantaneous exposure values defined in NOPSEMA Bulletin #1 Oil Spill Modelling (April 2019).

A review of available EPs identified that the potential extent of several small marine diesel spills has been modelled, including surface spill volumes of 8 m^3 in offshore waters of northwest Western Australia (Woodside, 2022; Woodside, 2021). This modelling showed elevated hydrocarbon concentrations are limited to the immediate vicinity of the spill site, with exposure to surface hydrocarbon concentrations above 10 g/m^2 predicted to occur within 1 km of the release point, with little potential to exceed this threshold beyond this distance. The 10 g/m^2 threshold representing concentration above which ecological impacts are expected to occur (being the ‘moderate’ threshold listed in **Table 116**).

Table 116 Summary of the Hydrocarbon Exposure Thresholds

Exposure Type	Potential Level of Exposure	Hydrocarbon Concentration	Description
Surface hydrocarbons (floating) (g/m^2)	Low	1	This value represents the area where a visible sheen may be present on the surface but is below concentrations at which ecological impacts are expected to occur. It is indicative of perceived impacts and areas that may be temporarily closed as a precautionary measure. It predicts the potential for some socio-economic impact (visual/aesthetic).
	Moderate	10	This represents the minimum oil thickness at which ecological impacts (e.g. to birds and marine mammals) are expected to occur. It is the lowest "actionable" level where spill response may be possible.
	High	50	This value is the estimated minimum floating hydrocarbon threshold for containment and recovery and informs response planning.
Total submerged hydrocarbons (entrained) (ppb)	Low	10	This value establishes the planning area for scientific monitoring based on potential for exceedance of water quality triggers.
	High	100	This represents potential toxic effects, particularly sublethal effects to sensitive species and life stages.
Dissolved hydrocarbons (ppb)	Low	10	This value establishes the planning area for scientific monitoring based on potential for exceedance of water quality triggers.
	Moderate	50	This represents potential toxic effects, particularly sublethal effects to highly sensitive species and life stages of fish and invertebrates (e.g. larvae, plankton).
	High	400	This value represents toxic effects including lethal effects to sensitive species.
Accumulated hydrocarbons (shoreline) (g/m^2)	Low	10	This value represents light oiling (equivalent to 2 teaspoons of oil per m^2). It is indicative of perceived impacts and shorelines that may be temporarily closed as a precautionary measure and predicts the potential for some socio-economic impact (visual/aesthetic).
	Moderate	100	This represents the minimum oil thickness at which potential lethal ecological impacts (e.g. to intertidal invertebrates, shorebirds, mammals and reptiles) may occur. It also predicts areas likely to require clean-up effort.
	High	1000	This value predicts areas likely to require intensive clean-up effort. Potential significant impacts to coastal vegetation including mangroves and marshes.

8.3.2.3 EMBA Definition

For the purposes of this EP, and for the assessment of the potential impacts and risks associated with the worst-case credible hydrocarbon spill of 1,066 m^3 within the OA, the EMBA has been defined based on:

- The maximum extent of shoreline accumulation above the low exposure level (10 g/m^2);
- The maximum extent of sea surface exposure above the low exposure level (1 g/m^2);
- The maximum extent of dissolved hydrocarbons above the low exposure level (10 ppb); and
- The maximum extent of the entrained hydrocarbons above the low exposure level (10 ppb).

The levels used to define the EMBA account for ecological impacts. However, the lower surface and shoreline exposure levels are also considered in the risk assessment in relation to perceived affects due to visible hydrocarbon sheens that may result in area closures of areas and potential socio-economic impacts.

8.3.2.4 Oil Spill Modelling Results

Section 8.3.2.4.1 to **Section 8.3.2.4.4** summarise the results for the oil spill scenarios, expressed as the maximum probability (across annual conditions) of exposure to individual sensitive receptors for each modelled release location.

In addition to the above, a separate request was made of RPS to provide maximum probability (across annual conditions) of exposure to BIAs within the EMBA. The full results of this can be found within Addendum 1 to the spill modelling report within **Appendix C**, with specific discussions around the relevant BIAs found throughout **Section 8.3.3.2**.

The results represent the total exposed area resulting from all 500 simulations at each release site over the total 50-day model duration. At any one point in time, the sea surface area exposed during an actual spill would be significantly smaller.

The results show that the fate of spilled MDO in the Otway Basin is highly dependent on seasonal patterns of surface currents (which are described as variable across spring to summer, and easter, northeast across autumn to winter), seasonal current speed/direction, and seasonal wind speed/direction. Modelling outcomes indicated spills travelled in a general east to southeast direction (**Table 117**)

8.3.2.4.1 Sea Surface Exposure

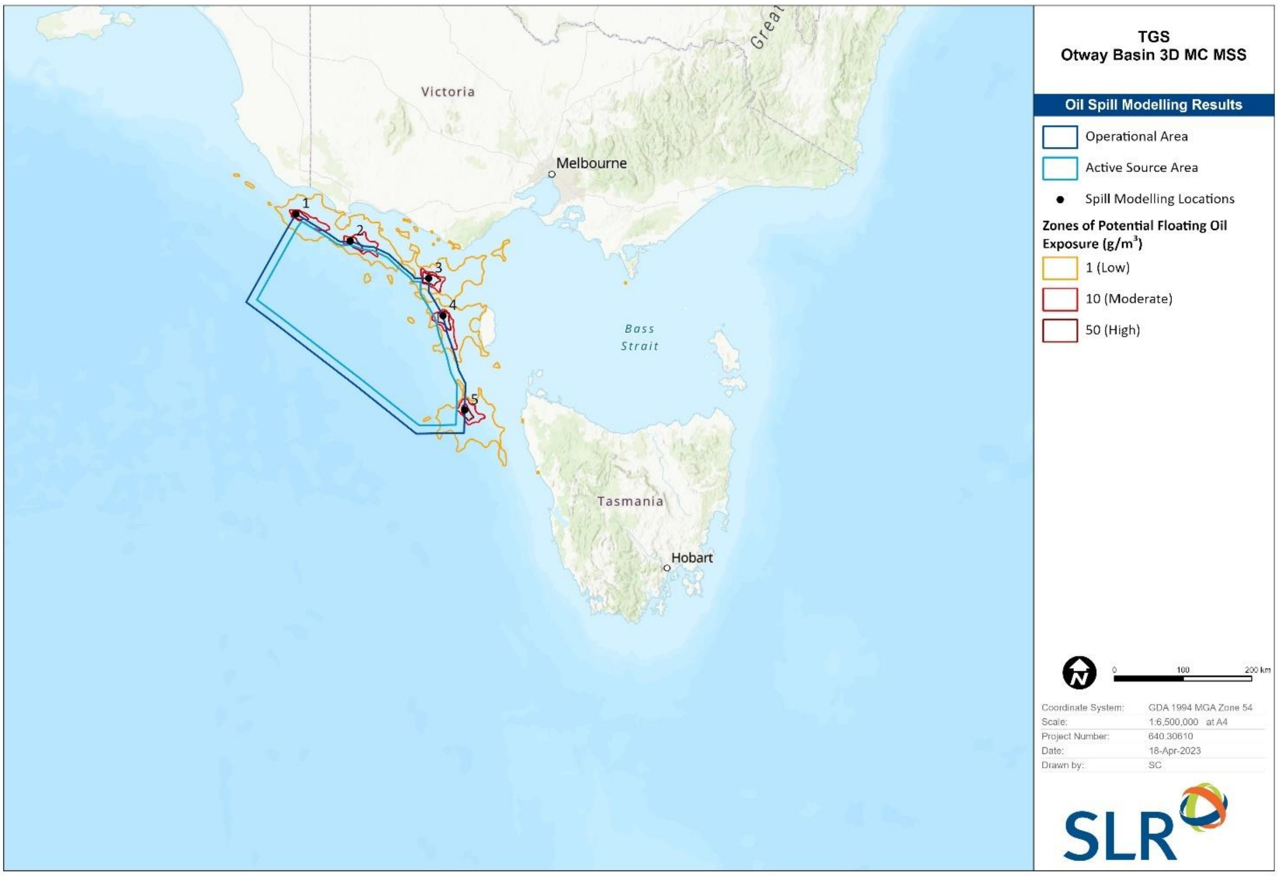
The maximum distance from a release site to low (1 – 10 g/m^2), moderate (10 – 50 g/m^2) and high (≥50 g/m^2) exposure levels were 243.2 km east (Release Location 1), 52.5 km east-southeast (Release Location 1) and 22.9 km south-southeast (Release Location 4), respectively (**Table 117**) (RPS 2023) and seen in **Figure 88**.

Table 117 Maximum Distances and Directions Travelled by Floating Oil for Each Exposure Threshold from an MDO Survey Vessel Tank Rupture at the Five Selected Release Locations

Release locations	Distance and direction	Zones of potential sea surface exposure		
		Low (1-10 g/m2)	Moderate (10-50 g/m2)	High (>50 g/m2)
1	Maximum distance from release site (km)	243.2	52.5	18.3
	Maximum distance from release site (km) (99th percentile)	176.6	50.1	17.6
	Direction	East	East-southeast	East-southeast
2	Maximum distance from release site (km)	141.5	44.5	21.8
	Maximum distance from release site (km) (99th percentile)	129	39.7	21.3
	Direction	East-southeast	South-southeast	East-southeast
3	Maximum distance from release site (km)	128.6	24.3	16.2
	Maximum distance from release site (km) (99th percentile)	111.2	22.6	15.1
	Direction	East-southeast	Southeast	East
4	Maximum distance from release site (km)	86.7	51.9	22.9
	Maximum distance from release site (km) (99th percentile)	74.2	49.1	19.6
	Direction	South-southeast	East-southeast	South-southeast
5	Maximum distance from release site (km)	140.8	30.0	15.4
	Maximum distance from release site (km) (99th percentile)	92.8	28.5	15.3
	Direction	East-southeast	East-southeast	East-southeast

Source: RPS, 2023

Note: The results were derived from 100 spill simulations per location and presented as an annual assessment.



Note: The results were derived from 100 spill simulations per location and presented as an annual assessment

Figure 88 Hydrocarbon Spill Scenario from Release Locations 1 – 5 for a 1,066 m^3 MDO spill – Potential Floating Oil Exposure

Table 118 provides a summary of the potential exposure from floating oil to sensitive receptors. Of particular interest includes exposure to AMPs at the low threshold was predicted for Release Location 3 (Apollo, 11%) and Release Location 4 (Zeehan, 65%). Twelve spill simulations (or 12% probability) had crossed into the VIC state waters from Release Location 1 at the low threshold. From Release Location 4, the probability of the spill simulations crossing the TAS and VIC state waters at the low threshold was 10% and 1%, respectively. The Discovery Bay and Twelve Apostles AMPs were exposed by 2 and 1 simulations (2% and 1% probability), respectively from Release Location 1 (RPS, 2023).

Table 118 Summary of the Potential Sea Surface (Floating) Exposure Sensitive Receptors from a Release of 1,066 m^3 at the Five Selected Release Locations

Release location	Receptor		Probability of oil exposure on the sea surface (floating) (%)			Minimum time before oil exposure on the sea surface (floating) (days)		
			L	M	H	L	M	H
1	IBRA	Bridgewater	3	-	-	2.25	-	-
		Glenelg Plain	1	-	-	4.42	-	-
		Otway Plain	1	-	-	6.21	-	-

Release location	Receptor		Probability of oil exposure on the sea surface (floating) (%)			Minimum time before oil exposure on the sea surface (floating) (days)		
			L	M	H	L	M	H
		Otway Ranges	1	-	-	7.96	-	-
		Warrnambool Plain	1	-	-	12.21	-	-
	IMCRA	Otway	59	9	2	0.13	0.17	0.29
	MP	Discovery Bay	2	-	-	1.63	-	-
		Twelve Apostles	1	-	-	9.83	-	-
	KEF	Bonney Coast Upwelling	15	-	-	1.08	-	-
		West Tasmania Canyons	1	-	-	3.54	-	-
	State waters	Victoria	12	-	-	1.5	-	-
2	IMCRA	Otway	100	100	63	0.04	0.04	0.04
	KEF	Bonney Coast Upwelling	1	-	-	1.71	-	-
3	AMP	Apollo	11	-	-	2.42	-	-
	IBRA	King Island	1	-	-	5.58	-	-
	IMCRA	Central Bass Strait	9	-	-	3.29	-	-
		Central Victoria	1	-	-	3.75	-	-
		Otway	100	100	88	0.04	0.04	0.04
	KEF	West Tasmania Canyons	1	-	-	3.88	-	-
	State waters	Tasmania	1	-	-	5.58	-	-
4	AMP	Zeehan	65	19	9	0.25	0.33	0.5
	IBRA	King Island	4	-	-	5.29	-	-
	IMCRA	Flinders	1	-	-	10.63	-	-
	IMCRA	Otway	100	100	70	0.04	0.04	0.04
	KEF	West Tasmania Canyons	12	-	-	0.63	-	-
	State waters	Tasmania	10	-	-	3.38	-	-
		Victoria	1	-	-	10.63	-	-
5	IBRA	King Island	1	-	-	11.92	-	-
	IBRA	Tasmanian West	1	-	-	10.83	-	-
	IMCRA	Franklin	9	1	-	1.17	1.25	-
	IMCRA	Otway	13	1	-	0.96	1.25	-
	KEF	West Tasmania Canyons	80	41	13	0.04	0.04	0.08
	State waters	Tasmania	2	-	-	10.83	-	-

Source: RPS, 2023.

L= Low, M= Moderate, H= High

Results calculated from 100 spill trajectories (per site) during annual conditions and each simulation was based on a hypothetical 1,066 m3 surface release of MDO over six hours, tracked for 50 days.

8.3.2.4.2 Shoreline Exposure

Table 119 presents a summary of the predicted shoreline accumulation for the five selected release locations modelled from all 500 simulations. The probability of accumulation on any shoreline at, or above, the low threshold (≥ 10 g/m^2) was greatest at Release Location 5 (65%), while the minimum time before shoreline accumulation was 1.7 days at Release Location 1. The maximum volume of oil ashore for a single spill above the low threshold was greatest at Release Location 1 (126.5 m^3) and lowest at Release Location 2 (28.7 m^3). The maximum lengths of shoreline contacted at the low and moderate thresholds were 65.0 km (Release Location 5) and 15.0 km (Release Locations 1 and 4), respectively. Additionally, the maximum lengths of oil accumulation on shorelines at the high threshold (≥1,000 g/m^2) was 2 km recorded at Release Locations 1 and 4.

Table 120 lists the potential shoreline loading for the specified thresholds from all 500 simulations. Individual receptor exposures across the five separate release locations are listed in the full oil spill modelling report, and are summarised as follows (see RPS, 2023 in **Appendix C** for full details):

- The greatest probabilities of oil accumulation to shoreline sectors at the low threshold for a spill occurring was recorded at Corangamite (22%), Colac Otway (10%), King Island (9%), King Island (37%) and West Coast (42%) shorelines (Release Locations 1, 2, 3, 4 and 5, respectively);
- The King Island shoreline recorded the greatest probabilities of oil accumulation for the moderate and high thresholds from spills occurring at Release Location 4 (20% and 3%, respectively);
- Glenelg recorded the quickest time before oil accumulation at the low threshold at 1.67 days from a spill at Release Location 1; and
- The Glenelg shoreline was also predicted to experience the greatest peak volume ashore of 123.6 m^3 from a spill occurring at Release Location 1.

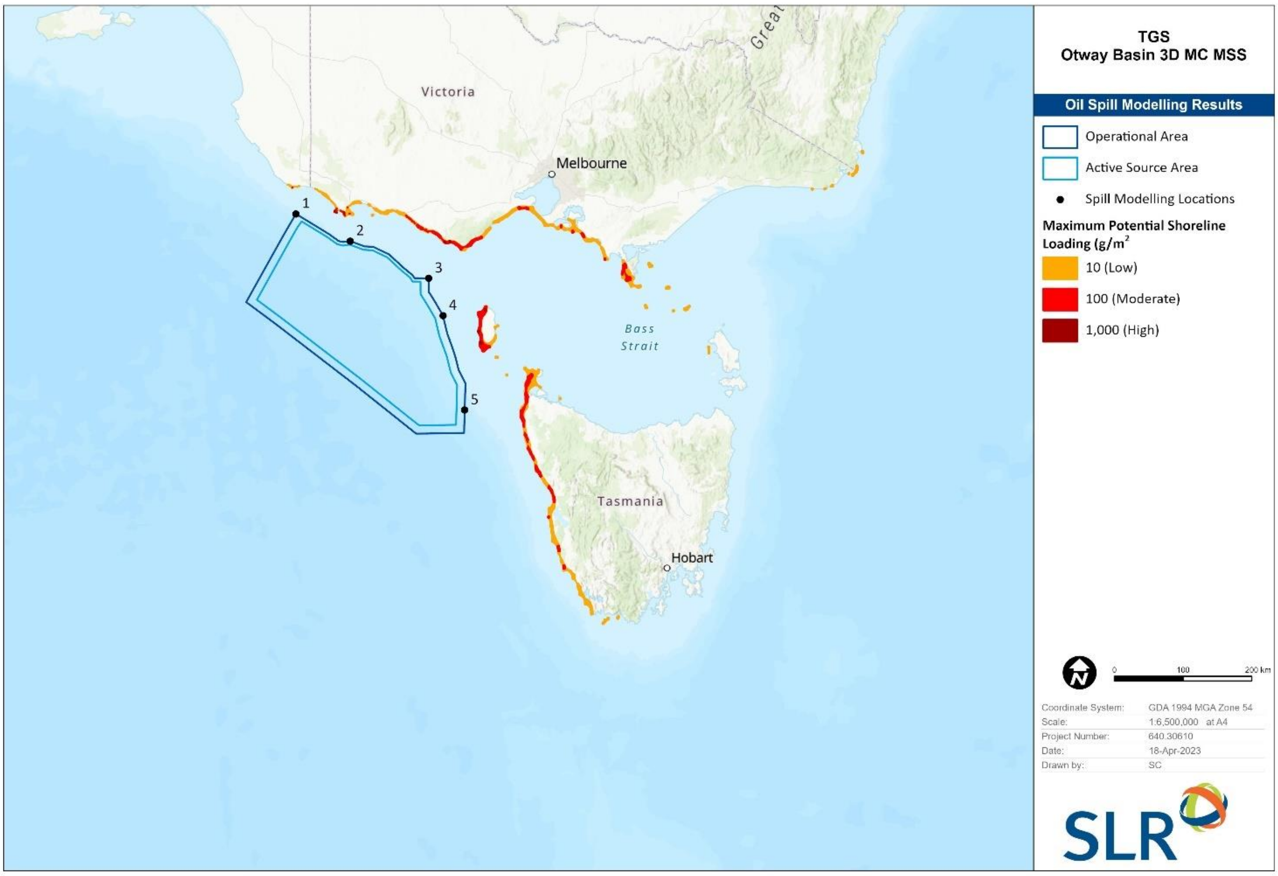
Table 119 Summary of Oil Accumulation on any Shoreline from an MDO Survey Vessel Tank Rupture for The Five Selected Release Locations Modelled

Shoreline Statistics	Location 1	Location 2	Location 3	Location 4	Location 5
Probability of accumulation on any shoreline (%) at or above the low threshold (10 g/m^2)	47	46	51	53	65
Absolute minimum time before oil ashore (days) at or above the low threshold (10 g/m^2)	1.7	6.8	3.5	3.4	3.2
Maximum volume of hydrocarbons ashore (m^3)	126.5	28.7	68.0	66.2	46.5
Average volume of hydrocarbons ashore (m^3)	12.1	2.9	2.9	7.2	3.8
Maximum length of the shoreline at 10 g/m^2 (km)	49.0	42.0	37.0	49.0	65.0
Average shoreline length at 10 g/m^2 (km)	18.5	13.7	11.5	18.5	20.4
Maximum length of the shoreline at 100 g/m^2 (km)	15.0	12.0	11.0	15.0	14.0
Average shoreline length at 100 g/m^2 (km)	7.2	4.7	4.6	6.8	5.0

Shoreline Statistics	Location 1	Location 2	Location 3	Location 4	Location 5
Maximum length of the shoreline at 1,000 g/m^2 (km)	2.0	-	1.0	2.0	-
Average shoreline length at 1,000 g/m^2 (km)	2.0	-	1.0	1.3	-

Source: RPS, 2023

The results were derived from 100 spill simulations per location and presented as an annual assessment



Note: The results were derived from 100 spill simulations per location and presented as an annual assessment

Figure 89 Hydrocarbon Spill Scenario from Release Locations 1-5 for a 1,066 m^3 MDO spill – Potential Beaching

Table 120 Summary of Oil Accumulation to Individual Shoreline Sectors from an MDO Survey Vessel Tank Rupture Derived From all 500 Simulations During Annualised Conditions

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m2)		Volume on shoreline (m3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Albatross Island	3.21	-	-	32	32	< 0.1	< 0.1	1.9	-	-	2.9	-	-
Anser Island	10.42	11.17	-	5	214	< 0.1	1.7	1.2	1	-	1.9	1	-
Bass Coast	12.71	14.46	-	2	220	< 0.1	7.7	7.9	4.8	-	18.2	4.8	-
Bega Valley	12.13	-	-	1	87	< 0.1	0.5	4.8	-	-	4.8	-	-
Black Pyramid	6.67	-	-	5	94	< 0.1	0.3	1	-	-	1	-	-
Circular Head	4.75	6.08	-	3	420	0.2	19.2	14.7	5.3	-	57.4	12.4	-
Colac Otway	5.92	8.67	-	2	278	< 0.1	12.5	10.4	4.6	-	39.2	11.5	-
Coorong	30.96	-	-	< 1	14	< 0.1	0.4	3.8	-	-	3.8	-	-
Corangamite	5.5	6.63	-	3	268	< 0.1	10.2	9.4	3.8	-	29.6	8.6	-
Curtis Island	11.08	-	-	2	29	< 0.1	0.2	1.7	-	-	2.9	-	-
De Witt Island	16.21	-	-	2	38	< 0.1	0.2	1.9	-	-	1.9	-	-
East Gippsland	39.63	-	-	< 1	78	< 0.1	1.5	2.5	-	-	3.8	-	-
French Island	26.42	-	-	< 1	25	< 0.1	0.3	1.3	-	-	1.9	-	-
Gabo Island	12.54	-	-	3	35	< 0.1	0.3	1.4	-	-	1.9	-	-
Glenelg	6.5	6.83	11.17	6	1,487	0.3	44.2	9.8	6.3	1	33.5	12.4	1
Glennie Group	13.5	28.46	-	3	103	< 0.1	2.9	4	1	-	6.7	1	-
Grant	3.42	4.04	8.21	7	1,749	0.4	51.2	13.2	7	1.9	36.3	13.4	1.9

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m2)		Volume on shoreline (m3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Greater Geelong	10.33	11.71	-	3	851	< 0.1	13.9	16.8	2.9	-	24.9	4.8	-
Hogan Island Group	11.75	-	-	2	57	< 0.1	0.3	3.1	-	-	5.7	-	-
Hunter Island	4.33	6.17	-	3	337	< 0.1	12.1	12.6	3.7	-	25.8	7.6	-
Huon Valley	18.92	-	-	1	78	< 0.1	2.3	4.1	-	-	7.6	-	-
Kangaroo Island	49.67	-	-	< 1	10	< 0.1	0.2	1.9	-	-	1.9	-	-
Kanowna Island	10.04	11.17	-	4	214	< 0.1	3.1	1.9	2.9	-	3.8	2.9	-
Kent Island Group	15.96	-	-	1	33	< 0.1	0.3	1.8	-	-	4.8	-	-
King Island	3.38	3.96	5.63	7	1,684	0.7	53.1	16.2	6	1.2	46.8	14.3	1.9
Kingston	23.5	-	-	1	45	< 0.1	2.1	12.4	-	-	12.4	-	-
Lady Julia Percy Island	9.67	-	-	3	43	< 0.1	0.2	1	-	-	1	-	-
Laurence Rocks	10.42	-	-	2	55	< 0.1	0.5	1.9	-	-	2.9	-	-
Maatsuyker	14.75	-	-	1	14	< 0.1	< 0.1	1.4	-	-	1.9	-	-
Moncoeur Islands	20.58	-	-	2	59	< 0.1	0.5	2.4	-	-	3.8	-	-
Mornington Peninsula	12.17	-	-	1	33	< 0.1	2	4.6	-	-	12.4	-	-
Moyne	8.75	12	-	2	123	< 0.1	3.6	6.4	2.9	-	14.3	2.9	-
Norman Island	12.42	13.5	-	6	394	< 0.1	6.4	2.1	1.9	-	4.8	1.9	-
Pasco Group	19.29	-	-	< 1	11	< 0.1	< 0.1	1	-	-	1	-	-
Phillip Island	11	13.25	-	2	232	< 0.1	4.7	4.1	3.8	-	13.4	3.8	-
Prime Seal Island	25.83	-	-	1	12	< 0.1	< 0.1	1	-	-	1	-	-
Reid Rock	3.88	-	-	3	98	< 0.1	0.3	2.3	-	-	2.9	-	-

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m2)		Volume on shoreline (m3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Robbins Island	12.79	-	-	< 1	11	< 0.1	< 0.1	1	-	-	1	-	-
Robe	5.58	6.08	-	5	457	< 0.1	11.4	7.2	4.5	-	18.2	5.7	-
Rodondo Island	12.88	-	-	3	27	< 0.1	< 0.1	1	-	-	1	-	-
Seal Islands	17.71	-	-	2	32	< 0.1	0.6	6.2	-	-	7.6	-	-
Shellback Island	13.88	16.04	-	12	294	< 0.1	2.8	1	1	-	1	1	-
Skull Rock	10.04	11.25	-	4	162	< 0.1	1.6	1.8	1.9	-	2.9	1.9	-
South Gippsland	11.17	11.67	-	2	237	< 0.1	10.1	7	2.5	-	18.2	5.7	-
Surf Coast	9.79	-	-	2	86	< 0.1	4.8	8.2	-	-	21	-	-
Three Hummock Island	12.04	-	-	1	42	< 0.1	< 0.1	1.3	-	-	1.9	-	-
Warrnambool	10.46	-	-	2	46	< 0.1	1.2	4.8	-	-	10.5	-	-
Wattle Range	5.54	5.83	-	5	416	< 0.1	16	12.7	4.8	-	32.5	11.5	-
West Coast	5.29	9.5	-	2	359	0.2	19.1	10.3	3.6	-	40.2	10.5	-
Yankalilla	46.42	-	-	1	10	< 0.1	0.1	1	-	-	1	-	-

Source: RPS, 2023

8.3.2.4.3 Water Column Exposure – Dissolved Hydrocarbons

Following a surface spill, hydrocarbons in the water column (at the surface, or deeper) can partition into a dissolved phase (dissolution of aromatic hydrocarbons into the water). Hydrocarbons that do not partition can remain entrained as homogenous oil droplets, suspended in the water column. Dissolved hydrocarbons represent the hydrocarbon phase with the main potential for toxicity effects, while entrained hydrocarbons have the potential for physical effects. Given their inherent relationship, the results of the modelling are discussed together.

Table 121 summarises the maximum dissolved hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0 – 10 m depth layer from an MDO survey vessel tank rupture at the five selected release locations. **Figure 90** illustrates the extent of the dissolved hydrocarbon exposure in the 0 – 10m, depth layer, based on all 500 spill simulation.

Exposure of AMPs to the low threshold (≥10 ppb) was recorded at the Apollo (4% Location 2, 9% Release Location 3 and 2% Release Location 4%), Boags (1% Release Location 5), Franklin (5% Release Location 5) and Zeehan (1% Release Locations 2 and 3; and 29% Release Location 4) AMPs.

Exposure of Interim Biogeographic Regionalisation for Australia (**IBRA**) to the low threshold occurred at four sites from Release Location 1, and at one site (being King Island IBRA) for Release Locations 3, 4, and 5.

The greatest maximum instantaneous concentration (ppb) in the 0 – 10 m depth layer was predicted to occur within the Otway IMCRA at Release Location 2 (358 ppb). The Otway IMCRA was predicted to be exposed across all five scenario release locations, with predicted maximum concentrations ranging from 107 ppb – 358 ppb.

State Marine Parks were predicted to be exposed to low threshold dissolved hydrocarbons only from Release Location 1. No Ramsar sites were predicted to be exposed to dissolved hydrocarbons.

For State waters and Near Shore waters, three sites were predicted to be exposed to low threshold concentrations, one site for Release Locations 2 and 3, and two sites for Release Location 5. No State or Near sore waters were predicted to be exposed to medium or high threshold dissolved hydrocarbons.

There were generally a greater number of sensitive receptors predicted to be exposed to low threshold concentrations, compared with receptors predicted to be exposed to moderate thresholds. No receptors were predicted to be exposed to high thresholds of dissolved hydrocarbons (>400 ppb).

With increasing distance from the release location, most of the more volatile and more toxic hydrocarbons (i.e. aromatics) will have dissolved, therefore any remaining entrained oil will have comparatively reduced toxicity potential. Given dissolved and entrained hydrocarbons are predicted to be limited to the upper 20 m of the water column and principally within the upper 10 m, exposure of deeper offshore benthic habitats and communities not discussed in the scenario modelling is not predicted to occur.

Table 121 Maximum Dissolved Hydrocarbon Concentrations and Probabilities of Exposure To Sensitive Receptors in the 0 – 10 m Depth Layer From an MDO Survey Vessel Tank Rupture at the Five Selected Release Locations

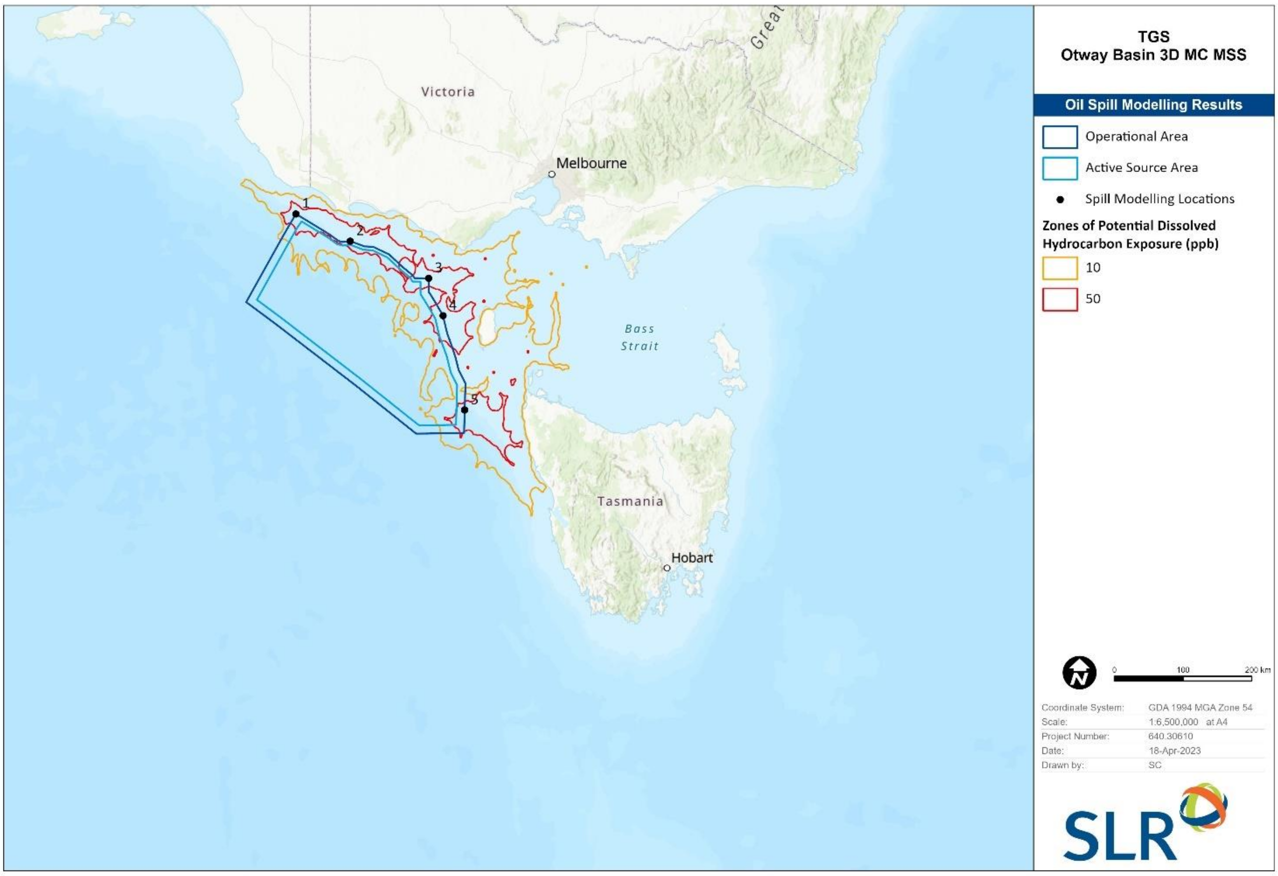
Receptor		Release Location 1				Release Location 2				Release Location 3				Release Location 4				Release Location 5			
		Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)		
			Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High
AMP	Apollo	-	-	-	-	33	4	-	-	112	9	1	-	37	2	-	-	-	-	-	-
	Boags	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	23	1	-	-
	Franklin	-	-	-	-	2	-	-	-	1	-	-	-	5	-	-	-	87	5	1	-
	Murray	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nelson	-	-	-	-	5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Zeehan	-	-	-	-	17	1	-	-	17	1	-	-	153	29	6	-	6	-	-	-
IBRA	Bridgewater	20	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg Plain	24	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	-	-	-	-	1	-	-	-	35	1	-	-	30	3	-	-	29	2	-	-
	Otway Ranges	13	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Warrnambool Plain	18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IMCRA	Boags	-	-	-	-	-	-	-	-	-	0	-	-	3	-	-	-	23	1	-	-
	Central Bass Strait	-	-	-	-	23	2	-	-	52	5	1	-	39	2	-	-	51	2	1	-

Receptor		Release Location 1				Release Location 2				Release Location 3				Release Location 4				Release Location 5			
		Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)		
			Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High
	Central Victoria	-	-	-	-	22	2	-	-	29	3	-	-	3	-	-	-	-	-	-	-
	Coorong	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Franklin	-	-	-	-	3	-	-	-	2	-	-	-	3	-	-	-	111	11	2	-
	Otway	108	23	10	-	358	66	32	-	318	79	42	-	352	73	49	-	107	10	3	-
KEF	Bonney Coast Upwelling	83	8	1	-	45	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
	West Tasmania Canyons	15	1	-	-	29	2	-	-	75	3	1	-	86	6	2	-	164	46	19	-
State Marine Parks	Discovery Bay	18.7	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Twelve Apostles	20.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramsar	Glenelg Estuary and Discovery Bay Wetlands	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reefs, shoals and banks	Bravenes Rock	12.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Receptor		Release Location 1				Release Location 2				Release Location 3				Release Location 4				Release Location 5			
		Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)		
			Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High
State waters	South Australia	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tasmania	-	-	-	-	2	-	-	-	35	3	-	-	41	6	-	-	38	3	-	-
	Victoria	44	4	-	-	15	1	-	-	8	-	-	-	1	-	-	-	-	-	-	-
Near shore waters	Black Pyramid	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	19	2	-	-
	Circular Head	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	29	2	-	-
	Corangamite	18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	24	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	-	-	-	-	1	-	-	-	35	1	-	-	28	4	-	-	-	-	-	-

Source: RPS, 2023

Note: The results were derived from 100 spill simulations per location and presented as an annual assessment



Note: The results were derived from 100 spill simulations per location and presented as an annual assessment

Figure 90 Hydrocarbon Spill Scenario from Release Locations 1 – 5 for a 1,066 m^3 MDO spill – Potential Dissolved Hydrocarbon Exposure

8.3.2.4.4 Water Column Exposure – Entrained Hydrocarbons

Table 122 summarises the maximum entrained hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0 – 10 m depth layer from an MDO survey vessel tank rupture at the five selected release locations.

Across all five Release Locations, a total of ten AMPs were predicted to be exposed at the low threshold (≥ 10 ppb), with probabilities up to 40%. The Apollo AMP was predicted to record the highest probabilities of exposure at 40% and 39% from spills originating from Release Location 3 and Release Location 1, respectively. Additionally, the Apollo AMP recorded the greatest probability of exposure at the high threshold (≥ 100 ppb) at 25% from spills originating from Release Location 3.

Otway IMCRA was exposed to high threshold across simulations from all five Release Locations. The maximum entrained hydrocarbon concentration was 30,878 ppb recorded for the Otway IMCRA from a spill originating at Release Location 3.

No state marine park, marine sanctuary, national park, National Parts Act (Schedule 4 park or reserve), Ramsar or reefs, shoals and banks sites were predicted to be exposed to high threshold across any of the simulations from the five Release Locations but were predicted to be exposed to a range of both low and high exposure thresholds (**Table 122**).

For State waters, VIC and TAS were exposed to high threshold concentrations of entrained hydrocarbons from Release Locations 1 and 4, respectively. For Nearshore waters, two sites were predicted to be exposed to high threshold concentrations, with the highest predicted concentration occurring at King Island Near shore waters (12,420 ppb, at 2% probability from Release Location 4). Glenelg Nearshore waters were predicted to be exposed to 1,059 ppb (with a 7% probability) from Release Location 1. As with other receptors, most nearshore waters were predicted to be exposed to variable low and high threshold concentrations across a range of probabilities.

Figure 91 illustrates the extent of the entrained hydrocarbon exposure in the 0 – 10 m layer, based on all 500 spill simulations.

Table 122 Maximum Entrained Hydrocarbon Concentrations and Probabilities of Exposure to Sensitive Receptors in the 0-10 m Depth Layer from an MDO Survey Vessel Tank Rupture at the Five Selected Release Locations

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
AMP	Apollo	299	39	3	593	35	10	1,650	40	25	506	11	2	9	-	-
	Beagle	91	10	-	59	9	-	120	15	1	63	12	-	24	4	-
	Boags	33	1	-	48	2	-	6	-	-	138	11	1	492	20	4
	East Gippsland	-	-	-	8	-	-	24	1	-	6	-	-	7	-	-
	Franklin	64	3	-	134	6	1	15	1	-	216	13	3	1,588	37	17
	Huon	-	-	-	3	-	-	2	-	-	3	-	-	27	4	-
	Murray	43	3	-	24	1	-	-	-	-	-	-	-	-	-	-
	Nelson	216	3	1	129	2	1	37	2	-	24	2	-	6	-	-
	Tasman Fracture	-	-	-	3	-	-	4	-	-	5	-	-	58	4	-
	Western Kangaroo Island	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Zeehan	322	9	3	369	15	3	301	19	9	6,449	73	56	251	4	1
IBRA	Bridgewater	1,002	16	9	108	3	1	32	1	-	2	-	-	-	-	-
	East Gippsland Lowlands	-	-	-	9	-	-	43	3	-	21	1	-	7	-	-
	Flinders	87	7	-	36	8	0	70	11	-	55	9	-	29	2	-
	Gippsland Plain	40	4	-	111	10	1	68	12	-	77	4	-	-	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Glenelg Plain	1,059	18	7	121	6	1	37	1	-	2	-	-	-	-	-
	King Island	88	8	-	103	10	1	547	17	4	1,034	39	20	560	27	7
	Otway Plain	516	26	5	289	19	3	149	11	1	4	-	-	-	-	-
	Otway Ranges	358	26	6	222	18	4	187	10	2	3	-	-	-	-	-
	Strzelecki Ranges	15	2	-	54	8	-	52	12	-	33	4	-	1	-	-
	Tasmanian South East	-	-	-	2	-	-	1	-	-	1	-	-	10	1	-
	Tasmanian Southern Ranges	-	-	-	3	-	-	2	-	-	3	-	-	25	4	-
	Tasmanian West	11	2	-	12	1	-	49	2	-	63	3	-	316	31	5
	Warrnambool Plain	450	26	5	215	14	4	205	11	2	2	-	-	-	-	-
	Wilsons Promontory	101	11	1	51	12	-	97	16	-	154	6	1	8	-	-
IMCRA	Batemans Shelf	20	1	-	32	3	-	14	1	-	9	-	-	1	-	-
	Boags	27	1	-	66	3	-	15	1	-	90	9	-	563	22	4
	Bruny	-	-	-	2	-	-	2	-	-	4	-	-	22	3	-
	Central Bass Strait	306	34	4	528	32	11	1,172	39	21	666	24	6	445	20	4
	Central Victoria	253	37	3	593	33	11	843	33	13	122	5	1	2	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Coorong	72	6	-	31	2	-	1	-	-	-	-	-	-	-	-
	Davey	12	2	-	7	-	-	4	-	-	18	1	-	155	8	1
	Flinders	104	12	1	59	13	-	121	18	1	164	12	1	38	4	-
	Franklin	22	2	-	114	6	1	60	4	-	142	7	3	2,030	40	24
	Freycinet	-	-	-	1	-	-	3	-	-	2	-	-	14	1	-
	Otway	6,927	52	38	26,664	91	84	30,878	100	94	26,901	95	93	3,403	39	23
	Twofold Shelf	93	8	-	49	8	-	103	13	1	59	9	-	25	1	-
	Victorian Embayments	11	1	-	12	1	-	28	4	-	7	-	-	-	-	-
KEF	Big Horseshoe Canyon	-	-	-	8	-	-	13	1	-	5	-	-	6	-	-
	Bonney Coast Upwelling	2,459	35	20	1,398	12	5	107	2	1	2	-	-	-	-	-
	Seamounts South and east of Tasmania	-	-	-	2	-	-	1	-	-	1	-	-	31	1	-
	Upwelling East of Eden	47	3	-	41	5	-	55	5	-	23	4	-	11	1	-
	West Tasmania Canyons	503	21	7	880	30	16	1,669	22	11	4,254	36	26	12,652	79	67
	Bunurong	-	-	-	51	10	-	29	4	-	10	-	-	-	-	-
	Cape Howe	-	-	-	15	1	-	38	2	-	17	1	-	8	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
State marine park	Churchill Island	-	-	-	44	7	-	21	3	-	4	-	-	-	-	-
	Discovery Bay	678	15	7	128	4	1	6	-	-	2	-	-	-	-	-
	Point Addis	-	-	-	112	3	1	93	9	-	4	-	-	-	-	-
	Point Hicks	-	-	-	9	-	-	29	2	-	18	1	-	3	-	-
	Port Phillip Heads	-	-	-	32	4	-	57	7	-	1	-	-	-	-	-
	Twelve Apostles	450	29	8	222	15	5	212	7	2	3	-	-	-	-	-
	Wilsons Promontory	79	10	-	39	12	-	119	16	1	149	6	1	3	-	-
Marine park	Lower South East	291	6	2	42	1	-	4	-	-	1	-	-	-	-	-
Marine sanctuary	Marengo Reefs	43	12	-	138	12	2	139	6	1	-	-	-	-	-	-
	Merri	90	5	-	118	7	1	11	1	-	-	-	-	-	-	-
	Mushroom Reef	12	2	-	63	8	-	28	6	-	5	-	-	-	-	-
	The Arches	277	19	2	63	7	-	199	3	1	-	-	-	-	-	-
National park	Kent Group	10	1	-	35	4	-	18	3	-	59	8	-	12	1	-
National Parks Act schedule 4	Bunurong Marine Park	-	-	-	46	8	-	37	3	-	3	-	-	-	-	-
	Corner Inlet Marine and Coastal Park	-	-	-	13	1	-	31	4	-	8	-	-	-	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Shallow Inlet Marine and Coastal Park	-	-	-	14	2	-	26	2	-	9	-	-	-	-	-
	Wilsons Promontory Marine Park	14	5	-	49	9	-	68	10	-	77	4	-	-	-	-
	Wilsons Promontory Marine Reserve	21	7	-	36	12	-	56	14	-	87	5	-	-	-	-
Ramsar	Corner Inlet	-	-	-	13	1	-	31	4	-	8	-	-	-	-	-
	Glenelg Estuary and Discovery Bay Wetlands	209	9	2	89	1	-	3	-	-	1	-	-	-	-	-
	Lavinia	-	-	-	17	1	-	25	2	-	26	6	-	8	-	-
	Piccaninnie Ponds Karst Wetlands	107	3	1	17	1	-	2	-	-	-	-	-	-	-	-
	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula	-	-	-	75	3	-	60	6	-	1	-	-	-	-	-
	The Coorong, and Lakes Alexandrina and Albert Wetland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Western Port	-	-	-	44	7	-	27	3	-	4	-	-	-	-	-
Reefs, shoals, banks	Bell Reef	19	3	-	14	1	-	36	3	-	217	25	3	192	1-	2
	Bravenes Rock	109	27	2	346	14	4	334	12	3	4	-	-	-	-	-
	Brown Rocks	-	-	-	7	-	-	25	1	-	12	1	-	302	21	4
	Cody Bank	17	3	-	58	9	-	31	11	-	42	1	-	-	-	-
	Cutter Rock	24	8	-	51	7	-	78	15	-	28	2	-	10	1	-
	Endeavour Reef	-	-	-	3	-	-	7	-	-	12	1	-	17	1	-
	New Zealand Star Bank	13	2	-	19	2	-	44	4	-	18	1	-	7	-	-
	Wakitipu Rock	-	-	-	10	1	-	10	-	-	8	-	-	25	1	-
	Warrego Rock	-	-	-	1	-	-	7	-	-	33	1	-	9	-	-
	Wright Rock	-	-	-	8	-	-	6	-	-	13	1	-	23	1	-
State Waters	New South Wales	11	1	-	15	1	-	33	1	-	14	1	-	9	-	-
	South Australia	330	7	3	55	3	-	4	-	-	1	-	-	-	-	-
	Tasmania	93	10	-	131	14	2	707	25	6	1,224	40	25	641	35	11
	Victoria State	1562	31	11	416	24	6	453	18	3	163	6	1	12	1	-
Nearshore waters	Albatross Island	-	-	-	71	3	-	21	1	-	48	5	-	589	22	5
	Anser Island	37	8	-	23	11	-	75	13	-	126	4	1	1	0	-

Receptor	Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
Bass Coast	-	-	-	65	8	-	43	4	-	4	-	-	-	0	-
Bega Valley	-	-	-	9	-	-	34	1	-	13	1	-	7	0	-
Black Pyramid	51	2	-	19	1	-	11	1	-	163	13	2	413	19	6
Bruny Island	-	-	-	1	-	-	1	-	-	1	-	-	10	1	-
Chalky Island	-	-	-	-	-	-	-	-	-	1	-	-	15	1	-
Circular Head	-	-	-	14	1	-	27	2	-	63	3	-	340	27	7
Colac Otway	516	26	6	289	19	3	155	11	1	2	-	-	-	-	-
Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corangamite	450	26	6	218	14	4	205	11	2	2	-	-	-	-	-
Craggy Island	-	-	-	1	-	-	6	-	-	26	1	-	9	-	-
Curtis Island	11	1	-	34	5	-	70	10	-	50	9	-	20	2	-
De Witt Island	-	-	-	4	-	-	2	-	-	8	-	-	5-	5	-
East Gippsland	-	-	-	8	-	-	35	3	-	21	1	-	6	-	-
East Kangaroo Island	-	-	-	-	-	-	-	-	-	1	-	-	11	1	-
Flinders Island	-	-	-	1	-	-	1	-	-	5	-	-	14	1	-
French Island	-	-	-	29	2	-	12	1	-	2	-	-	-	-	-
Gabo Island	-	-	-	8	-	-	43	2	-	17	1	-	6	-	-
Glenelg	1,059	31	7	121	6	1	55	1	-	2	-	-	-	-	-

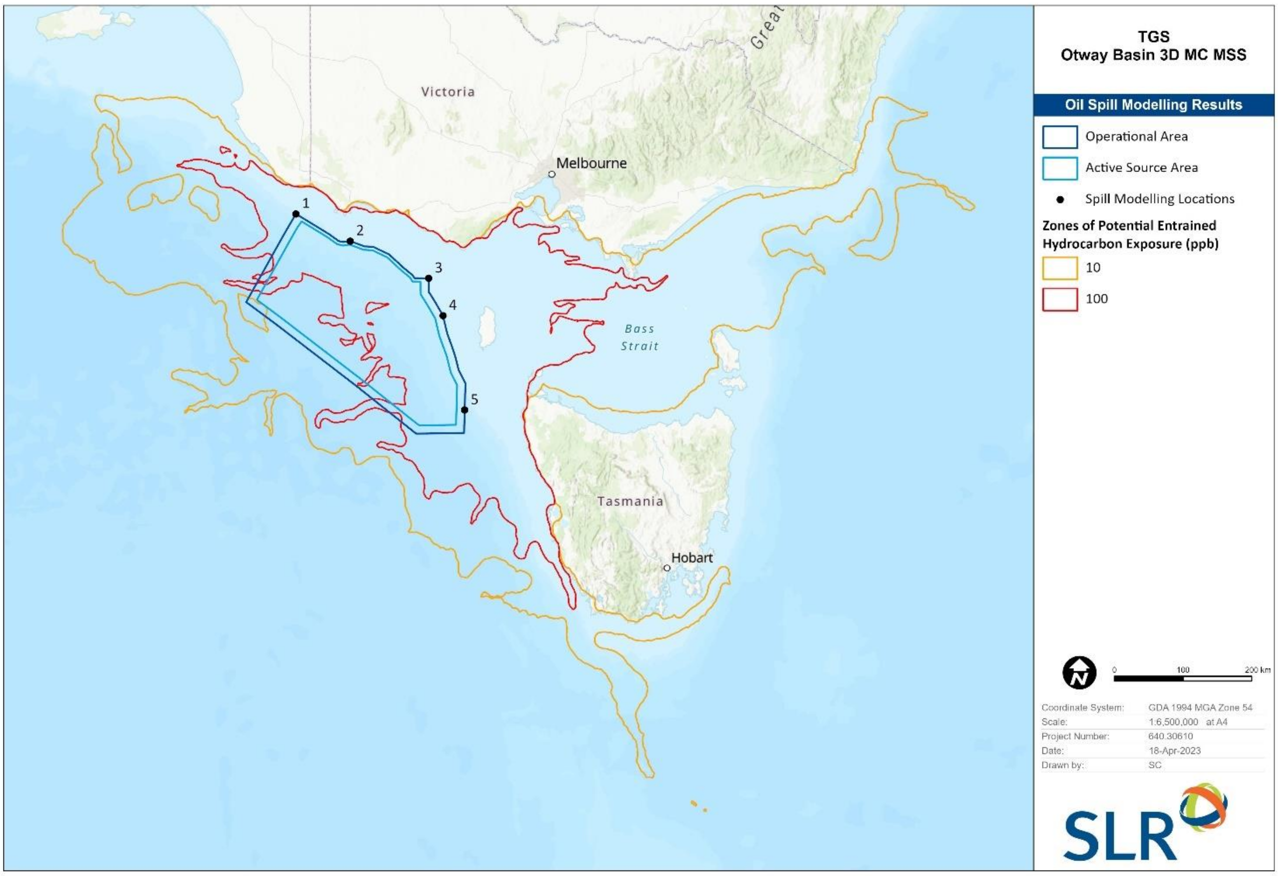
Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Glennie Group	30	9	-	36	12	-	69	16	-	87	6	-	1	-	-
	Grant	229	5	1	38	2	-	3	-	-	-	-	-	-	-	-
	Greater Geelong	-	-	-	123	4	1	75	7	-	2	-	-	-	-	-
	Hogan Island Group	87	7	-	36	8	-	70	11	-	2-	3	-	8	-	-
	Hunter Island	-	-	-	15	1	-	26	1	-	12	3	-	355	19	6
	Huon Valley	10	1	-	5	-	-	2	-	-	17	1	-	53	8	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	54	10	-	23	11	-	97	14	-	154	4	1	1	-	-
	Kent Island Group	11	1	-	35	4	-	19	3	-	55	9	-	13	1	-
	King Island	88	8	-	103	10	1	547	17	5	12,420	39	2	26	2	-
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	61	16	-	131	6	2	97	1	-	1	-	-	-	-	-
	Laurence Rocks	240	15	4	167	6	2	35	1	-	2	-	-	-	-	-
	Maatsuyker Island	-	-	-	6	-	-	3	-	-	1-	-	-	63	5	-
	Mewstone	-	-	-	3	-	-	2	-	-	4	-	-	17	4	-
	Moncoeur Islands	97	10	-	39	9	-	83	15	-	45	4	-	8	-	-

Receptor	Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
Mornington Peninsula	40	4	-	68	8	-	49	9	-	5	-	-	-	-	-
Moyne	396	25	5	215	9	3	157	5	1	1	-	-	-	-	-
Mud Island	-	-	-	15	2	-	20	4	-	1	-	-	-	-	-
Norman Island	17	6	-	48	11	-	60	11	-	101	4	1	-	-	-
Outer Sister Island	-	-	-	1	-	-	1	-	-	14	1	-	6	-	-
Pasco Group	-	-	-	1	-	-	-	-	-	1	-	-	18	1	-
Phillip Island	12	1	-	111	9	1	41	6	-	8	-	-	-	-	-
Prime Seal Island	-	-	-	1	-	-	-	-	-	1	-	-	18	1	-
Pyramid Island	-	-	-	20	1	-	9	-	-	1-	-	-	29	1	-
Reef Island	-	-	-	-	-	-	-	-	-	1	-	-	11	1	-
Reid Rock	20	3	-	56	5	-	36	3	-	248	31	6	155	9	2
Robbins Island	-	-	-	7	-	-	2	-	-	3	-	-	19	1	-
Robe	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Rodondo Island	101	11	1	40	7	-	90	15	-	82	4	-	8	-	-
Round Top Island	-	-	-	4	-	-	3	-	-	6	-	-	40	4	-
Seal Islands	11	1	-	15	1	-	31	3	-	52	1	-	1	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Shellback Island	11	5	-	51	9	-	68	10	-	79	4	-	-	-	-
	Skull Rock	53	10	-	23	11	-	95	15	-	148	4	1	1	-	-
	South Gippsland	39	8	-	57	11	-	68	12	-	113	4	1	1	-	-
	Surf Coast	-	-	-	107	3	1	87	8	-	4	-	-	-	-	-
	The Pages	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
	Three Hummock Island	-	-	-	26	1	-	10	0	-	7	-	-	100	14	-
	Warrnambool	290	10	1	155	7	2	16	1	-	1	-	-	-	-	-
	Wattle Range	-	-	-	8	-	-	1	0	-	-	-	-	-	-	-
	Wellington	-	-	-	1	-	-	10	1	-	2	-	-	-	-	-
	West Coast	11	2	-	12	1	-	49	2	-	45	3	-	316	31	5

Source: RPS, 2023

The results were derived from 100 spill simulations per location and presented as an annual assessment



Note: The results were derived from 100 spill simulations per location and presented as an annual assessment

Figure 91 Zones of Potential Entrained Hydrocarbon Exposure in the 0-10 m Depth Layer from an MDO Survey Vessel Tank Rupture

8.3.3 Evaluation of Known and Potential Impacts and Risk to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 123**.

Table 123 Environmental Receptors Assessed

Receptor	Section reference
Marine environment quality (water and air quality)	**Section 8.3.3.1**
Benthic invertebrates	**Section 8.3.3.2.1**
Zooplankton, fish eggs and larvae	**Section 8.3.3.2.2**
Bony fish and elasmobranchs	**Section 8.3.3.2.3**
Marine reptiles	**Section 8.3.3.2.4**
Cetaceans	**Section 8.3.3.2.5**
Seabirds and migratory shorebirds	**Section 8.3.3.2.6**
Cultural and heritage sites	**Section 8.3.3.3**
Coastal marine environment	**Section 8.3.3.4**

Potential effects of a hydrocarbon spill on the marine environment will be influenced by factors such as the weather and sea conditions at the time (**Section 8.3.2**), the specific characteristics of the hydrocarbon fuel type, effectiveness of clean-up/response measures (**Table 126**) and the sensitivity of the environment and organisms that exist in the affected area (**Section 4**). Hydrocarbon spills will affect the water quality in the upper surface waters of the water column and can cause immediate/acute chemical and physical impacts to marine species, as well as longer term/chronic impacts such as bioaccumulation in the food chain and behavioural changes (e.g. predator/prey interactions).

The known effects of hydrocarbon spills on the marine environment are well documented and include, but are not limited to:

- Direct and indirect toxicity effects (e.g. Alonso-Alvarez *et al.,* 2007; Almeida *et al*., 2012; Schwacke *et al*., 2013);
- Removal and damage to, or exclusion from habitats and other important areas (Lee and Page, 1997);
- Bioaccumulation in the food chain, disruption of food chains and predator/prey interactions (e.g. Abbriano *et al.,* 2011; Ansari *et al.,* 2012; Wise *et al*., 2014);
- Loss of waterproofing, buoyancy, swimming ability, filtering capabilities, and thermoregulatory abilities from external oiling (especially in pinnipeds and seabirds) (e.g. Jenssen, 1994; O'Hara and Morandin, 2010); and
- Exclusion of users of the marine environment due to contamination/tainting of edible species or altered perception (e.g. Law and Hellou, 1999; McCrea-Strub *et al.,* 2011; Balcioglu, 2016).

Different hydrocarbon fuel types have different chemical characteristics which influence the fate if released into the receiving environment. The bulk of MDO spilled into the marine receiving environment will, over time, become dispersed, and undergo physical evaporation, with a component expected to become gradually submerged, and a low proportion potentially beached. Depending on location and prevalent weather conditions, the rate of other attenuation processes (dispersion, dilution, partitioning, beaching, biodegradation and photo-oxidation) will be affected.

Dissolved hydrocarbons are bioavailable and incur higher toxicity than entrained hydrocarbons. Dissolved hydrocarbons can be taken up by organisms directly from the water column by absorption through external surfaces and gills, as well as through the digestive tract (RPS, 2023). These bioavailable hydrocarbons are broken down by microbial decay and biodegradation. Biodegradation rates are relatively high for hydrocarbons in dissolved state or in dispersed small droplets.

Entrained hydrocarbons refer to the droplets of oil within the water column, these are not in the dissolved phase. The toxicity of entrained hydrocarbons is driven by the concentration of soluble aromatics (e.g. polycyclic aromatic hydrocarbons). Entrained hydrocarbons that are significantly weathered and have lost much of their soluble (aromatic) content comprise insoluble hydrocarbons that are less toxic but have the potential to persist and incur physical effects to marine organisms through direct contact with tissues of organisms (such as adhering to fish gills or filter feeding organisms) and uptake of oil droplets by direct consumption (RPS, 2023).

Entrained and dissolved hydrocarbons incur a range of physico-chemical responses at both chronic and acute toxicity levels, if a spill is left unmitigated. The risks of adverse effects are discussed in the following sections.

8.3.3.1 Potential Marine Environment Quality Impacts and Risks

A vessel collision has the potential to affect the local marine environment by impacting the surrounding water and air quality in the vicinity of the incident. In the highly unlikely event of a vessel collision/sinking these effects are predicted to be localised and temporary, and conditions will quickly return to background levels on account of weathering of spilled hydrocarbons, on-site response actions (if required), and in-water dilution effects.

Similarly, any release of hydrocarbon as a result of refuelling incident is, by comparison to a vessel collision, regarded as small and there will be negligible impacts on the physical marine environment. Given the small volume of release expected, any acute effects of a spill entering the marine waters are expected to be rapidly mitigated by immediate dilution and dispersion. On board control measures and operational contingencies are expected to minimise further release into the marine receiving environment (See **Section 8.3.5**).

A worst-case larger spill scenario along the northern extent in the OA could pose potentially longer-term impacts, given the increased likelihood of oil beaching. Oil beaching has the potential to interfere with sensitive receptors on near shore/intertidal areas, through habitat modification, or through the physical smothering/impairment of the animal itself (e.g. impairment of their feeding, respiratory and/or locomotory structures). The OA is located between ~38 km – ~82 km to the nearest shorelines (across VIC and TAS), with worst case oil spill modelling predicting a 46 to 65% chance of a section of the shoreline being affected by oil accumulation above the low threshold (see **Table 119**). Despite this, any potential hydrocarbon release is expected to undergo significant physical dispersion and dissolution, prior to any amount being beached. This is demonstrated for the 'worst case' spill scenario, whereby 11% of the modelled volume remained on the shoreline at the conclusion of the 50-day simulation (for a simulated release from Location 1), with the remainder lost to the atmosphere through evaporation (43%), decayed (38%), remaining on surface (<1%) or entrained (9%) (RPS 2023).

Localised seabed damage and disturbance could occur in the event that vessel debris makes contact with the seabed. Across much of the OA the seabed is likely to be composed of unconsolidated coarse carbonate sands (in shallower waters) to fine/muddy carbonate sands (in deeper waters) across the continental shelf area, and hard substrate across the inner shelf areas. Sinking debris would marginally disturb the seabed as it lands, with potential resuspension of finer-grained sediments.

Where possible, damaged vessels resulting from collision would be salvaged and returned to a suitable facility for repair or disposal, and smaller items of debris would be recovered.

Based on the above, the residual risk of a vessel collision and associated hydrocarbon spill on the physical marine environment has been assessed as **Low** (*minor* x *remote*).

The residual risk associated with refuelling and associated hydrocarbon release on the physical marine environment has been assessed as **Negligible** (*negligible* x *remote*).

8.3.3.2 Potential Biological Environment Impacts

Marine fauna in the open ocean areas of the OA is described as relatively mobile and are expected to be able to display avoidance behaviours in the event of any hydrocarbon release. By contrast, fauna (and flora) with less mobility that would not exhibit immediate behavioural response (e.g. plankton/primary producers, benthic species, early life stages (juveniles) of cephalopods and some vertebrate species), as well as benthic environments and coastal ecosystems could be at risk of being contacted by a hydrocarbon spill if a release event were to occur during a more sensitive life stage for the animal (i.e. seasonally depended), or on the southern extent of the OA whereby a higher probability of oil beaching may be incurred.

Potential adverse effects on the marine environment from marine debris released during a sinking event include entanglement and ingestion. Entangled individuals may drown, suffer from injury, or be subject to reduced foraging efficacy and/or predator avoidance. Ingestion of foreign debris is also a possibility which could lead to blocked digestive tracts, internal injury, and suppressed appetite (Laist, 1987). However, the majority of marine debris released through a vessel collision/sinking event would not be of the nature that would cause such effects (i.e. entanglement and ingestion is particularly problematic for plastics and discarded fishing gear), and the majority of such debris would likely remain contained within their collection receptacles onboard the vessel.

In the event of a vessel collision/sinking, the greatest impact to the biological environment will be associated with the release of hydrocarbons. Lighter oils, such as MDO, are significantly more toxic to marine organisms than heavy crude oils (NOAA, 2022), although lighter oils are less persistent in the marine environment due to evaporation of volatile components.

Environmental impacts from a spill following vessel collision/sinking in the marine environment will primarily be restricted to those species that inhabits the sea surface, mainly marine mammals, seabirds, and marine reptiles, although fish, cephalopods and zooplankton may also be impacted (at a chronic level) following dispersion and partitioning of any oil slick.

Any release of hydrocarbon as a result of refuelling incident is, by comparison to a vessel collision, regarded as small. The small volume of potential discharge would possibly impact the immediate surrounding water in the vicinity of the spill. Given the small volume of release expected, any acute effects of a spill entering the marine waters are expected to be rapidly mitigated by immediate dilution and dispersion – concentrations of concern would not be expected beyond a distance of around 1 km. On-board control measures and operational contingencies are expected to minimise further release into the marine receiving environment. Noting the OA covers waters deeper than 100 m, to reduce risks to sensitive surface water ecological values (which is they key area of concern for any oil spill event), TGS will not undertake refuelling at sea within 5 km of any AMP – these buffer areas are shown in **Figure 92**.

The 5 km buffer distance from these sensitive receptors is considered to be very conservative as the available literature suggests concentrations of concern are likely to be restricted to within 1 km of any likely spill during refuelling.

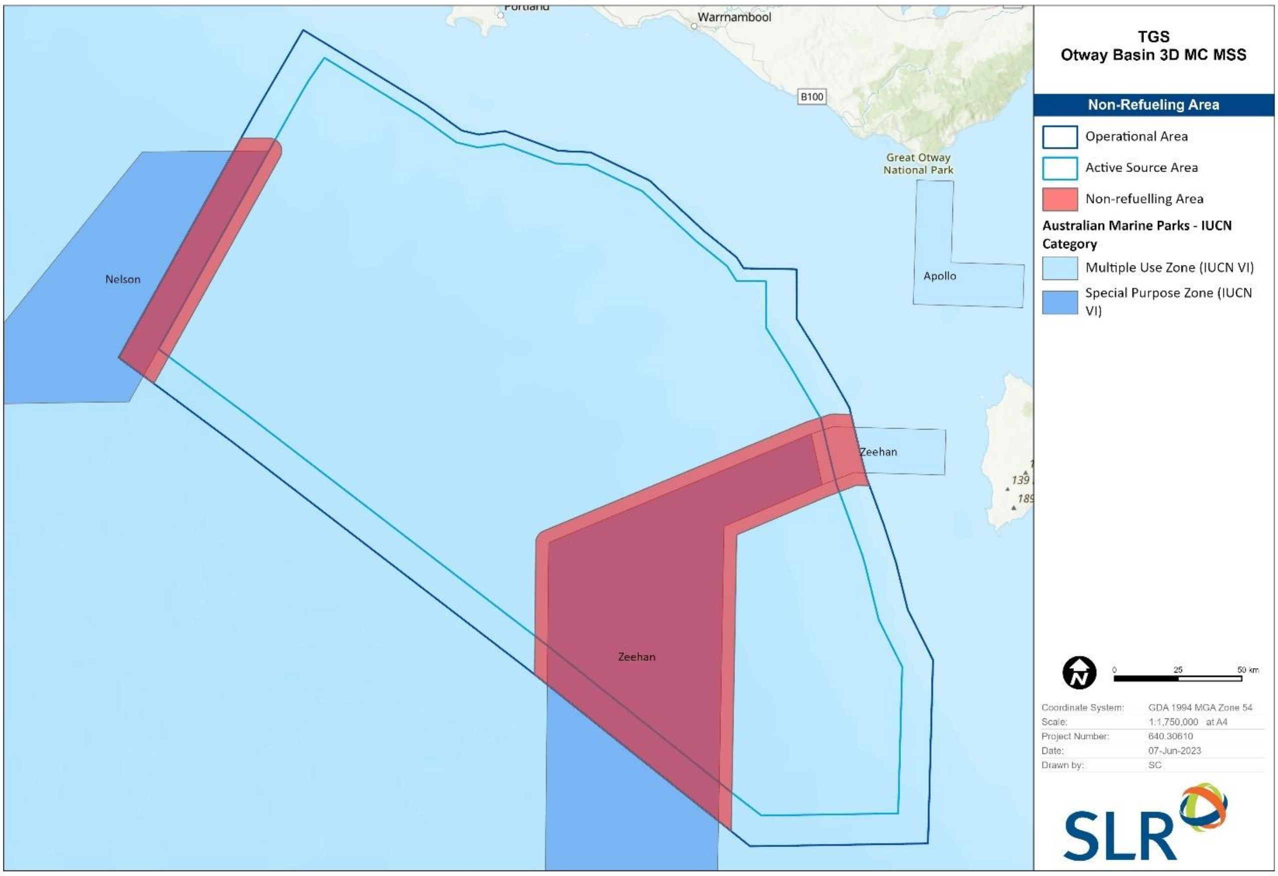


Figure 92 Proposed Non-Refuelling Areas

8.3.3.2.1 Benthic Invertebrates

A release of hydrocarbons under a worst-case scenario may impact benthic species under certain weather/spill conditions. Benthic invertebrate species likely to be present across the continental shelf may include sessile filter feeders (e.g. sponges, bryozoans, bivalves, scallops, stalk crinoids, soft corals), mobile macro-invertebrates (e.g. echinoderms, crustaceans) and bioturbating infauna (e.g. annelids) (see **Section 4.5.2**). The distribution of benthic invertebrates, however, is predominantly across deeper waters where the exposure to elevated hydrocarbon thresholds (exceeding the moderate thresholds of ecological concern) in waters deeper than 20 m is highly unlikely.

Sessile invertebrates across the continental shelf and species with low mobility (e.g. soft-sediment benthic invertebrates like echinoderms and crustaceans) may be susceptible to physical effects of vessel collision/sinking. Risk of exposure to any hydrocarbon release, however, is expected to be very low given the depth and expected dispersion/evaporation/dissolution of any spilled MDO into the marine receiving environment. Life history strategies (e.g., high fecundity, high recruitment) for many benthic invertebrates also ensures that if any adverse impacts are incurred, localised population resilience and recovery will be rapid.

The Otway Basin 3D MC MSS will be undertaken in waters ranging from 95 – 5,000 m in depth. This depth physically mitigates and attenuates any potential for direct oiling impacts on the benthic environment from a spill within the OA, given the spill plume will largely be buoyant in the surrounding ocean. Any oil beaching is more likely to incur potential direct acute and chronic effects to near shore/intertidal invertebrates if they come into direct contact with any beached MDO. This scenario is highly unlikely, and any effects are expected to be highly localised.

For marine invertebrates inhabiting nearshore or intertidal habitats, exposure to moderate threshold surface, dissolved, entrained or to beached oil poses potential impacts that may incur short term effects (i.e. impairment of behaviour, feeding, motility), or longer-term chronic effects (e.g. impaired growth and reduced fecundity). Behavioural and long-term chronic effects are generally incurred because of prolonged exposure, and a range of marine invertebrate species are not considered to be acutely sensitive to short-term elevations in oil concentrations (IPIECA, 2015).

One species of threatened seastar, the Tasmanian live-bearing seastar (*Parvulastra vivipara*) was identified within the EPBC Act Protected Matters Report as potentially present within the EMBA (see **Section 4.5.2**). The habitat is described as the upper intertidal zone of rocky shore areas of southeast TAS, which may be at risk of exposure to low thresholds (>10 ppb) of entrained hydrocarbons. Modelled distribution of shoreline accumulation of hydrocarbons indicated the southeast coast of TAS was not exposed to shoreline accumulation (rather, shoreline accumulation for TAS is a risk for the west coast).

Based on the predicted scenario modelling, exposure of nearshore/shallow water marine invertebrates to moderate threshold dissolved hydrocarbons is not likely to occur (see **Figure 90**). However, exposure of nearshore waters to entrained hydrocarbons may occur across some nearshore waters at the moderate threshold, as well as a low probability of exposure to high threshold levels (King Island). Any marine invertebrates exposed to moderate threshold entrained hydrocarbons may experience low level chronic effects, and exposure to high threshold may incur acute effects, though the probability of this is very low.

In the event of a spill close to the eastern edge of the OA (i.e. closest to TAS coastline), approximately 2% (26 m^3) of a worst-case oil spill was predicted to remain on the shoreline (after the 50 day simulation), present at levels exceeding either the low or medium exposure thresholds (RPS, 2023). The high exposure threshold was not predicted to be exceeded. Across the combined modelled outcomes, exposure to high range thresholds is only predicted across a subset of sites at King Island (TAS) and Portland (VIC), with correspondingly low probabilities of occurrence. The risk of exposure of resident marine invertebrate species to acute hydrocarbon concentrations, is thus also likely to be very low.

Based on the parameters of the proposed Otway Basin 3D MC MS, the control measures in place and the physical properties of the MDO if it is released in the marine environment, the potential for long-term impacts to benthic invertebrates from an MDO spill are very unlikely. The residual risk to benthic invertebrates arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.3.2.2 Zooplankton, Fish Eggs and Larvae

During and after an oil spill event, marine zooplankton, eggs, and larvae (as well as phytoplankton assemblages), may exposed to dissolved oil fractions and dispersed oil droplets. Several studies have demonstrated that plankton may take up dissolved petroleum hydrocarbons by passive mechanisms or consuming contaminated phytoplankton, as well as ingestion of oil droplets (Almeda *et al*., 2016). If dissolved fractions are high, acute toxicity thresholds may be incurred.

A hydrocarbon spill within the OA has the potential to overlap with two key areas (the Bonney Upwelling on the north-western extent of the EMBA, and the Tasmanian Canyon upwelling) identified as important for promoting high productivity. This is important for plankton distribution, in particular the coastal krill *Nyctiphanes australis*, a key contributing factor influencing aggregation of blue whales in the SEMR (see Section **4.5.1**).

A hydrocarbon spill within the OA also has the potential to overlap the Zeehan AMP – identified as a nursery ground for blue warehou and ocean perch (**Section 4.4.1**).

Depending on the time of year, in the event of an oil spill within the OA, larval stages of commercially targeted fish species (e.g. Blue warehou, blue grenadier, orange roughy, southern rock lobster, abalone, scallop and squid) may be affected. Larval stages of other important demersal and pelagic fish species, as well as macro-zooplankton assemblages (e.g. copepods and cladocerans) may also be impacted depending on the scale/location and timing of any oil spill event.

Across the extent of the EMBA, breeding areas of other fish may potentially be affected in the event of a large oil spill (e.g. up to 1,066 m^3). The northeastern extent of the EMBA is shown to intersect with the white shark breeding and foraging BIA (**Figure 21**), and nearshore waters identified as important habitats for smaller fish species such as pipefish are likely to also be important nursery habitats. Under a worst-case spill event, exposure to surface or entrained hydrocarbons may pose a risk of exposure to larval/egg stages present in any nearshore sensitive habitats. The probability of exposure exceeding the moderate or high thresholds (of ecological risk) are, however, low. Across the Zeehan AMP, the highest risk was identified for any accidental release of oil from Location 4 – resulting in a higher probability of acute toxicity thresholds across the AMP. Deterministic modelling, however, demonstrates that water column exposure to oil (via dissolved or entrained) will be a short duration, with the bulk of any volume lost though evaporation and degradation after 5 – 10 days (RPS, 2023).

Any hydrocarbon spill has the potential to reduce the water quality by increasing toxicity due to the presence of entrained/dissolved hydrocarbons, resulting in localised mortality of plankton due to potentially acute thresholds. Acute toxicity thresholds will be highest in areas close to the spill source. However, MDO is expected to rapidly evaporate and disperse/partition in the offshore marine environment, reducing the acute toxicity of the spill. Whilst localised mortality for zooplankton may occur, this is expected to be localised and short term. Due to their vertical stratification within the water column (eggs and larvae are generally not at the sea surface), eggs and larvae are less likely to come into direct contact with the bulk of any spill.

Planktonic communities impacted by a spill are expected to recover quickly (weeks/months) due to rapid fecundity and recruitment (ITOPF, 2011). The residual risk to plankton arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.3.2.3 Bony Fish and Elasmobranchs

The primary pathways to exposure for fish from a hydrocarbon spill are through direct dermal contact such as oiling of gills/smothering (Hook *et al*., 2016), and/or ingestion of contaminated prey.

Fish are also at risk from an MDO spill due to partitioning of dissolved hydrocarbons and any entrainment of hydrocarbons within the water column (leading to exposure through ingestion or dermal contact). This risk is reduced by the fact that adult fish have chemoreceptors – sensitive for detecting taste and smell, which can enable them to avoid the areas of a spill where there are hydrocarbons within the water column (NERA, 2018a).

Due to their mobility, it is unlikely that pelagic fish would be exposed to acutely toxic concentrations of spilled hydrocarbons for the extended periods of time required to result in acute toxicity to be incurred. NOAA (2012) and ITOPF (2011) have reported that deaths of adult fish are rarely observed from hydrocarbon spills in the open ocean due to the rapid dilution and evaporation.

The Otway Basin supports a diverse assemblage of fish, including three species of threatened fish within the OA, and five threatened and/or migratory species of sharks and rays which may be present within the OA. Within the EMBA there are 12 species of threatened fish and seven species of threatened elasmobranch (i.e. sharks, rays, and skates) identified within the EPBC Act Protected Matters Report (see **Section 4.5.3** for full details).

Several BIAs (important for foraging and migration) for grey nurse sharks were identified as overlapping the EMBA, up to 650 - 663 km NE of the OA. A BIA for the white shark was also identified as both overlapping the OA (distribution habitat), as well as breeding habitat overlapping the EMBA (at Corner Inlet, 285 km E of the OA).

Oil spill modelling (Addendum 1 to **Appendix C**) shows that, should a spill occur, both the white shark and grey nurse shark BIAs will be exposed in some way to the spilt hydrocarbons, a brief summary of these results are as follows:

- The grey nurse shark BIAs (both foraging and migration) will have a very low probability of being exposed to entrained hydrocarbons, with the greatest probability being 3% chance of being exposed to the low threshold from Release Location 2; and
- The white shark distribution BIA will be exposed to some extent due to its large spatial extent in relation to the OA. The white shark foraging BIA has a low chance of being exposed to both surface and dissolved hydrocarbons, but a higher chance of being exposed to entrained hydrocarbons, particularly from Release Location 1 (being a 25% probability of being exposed to the high threshold (>100 ppb). The white shark breeding BIA has, at most, a 6% chance of being exposed to the low threshold of entrained hydrocarbons from Release Location 3.

Information on the possible effects on sharks of an oil spill are largely unknown, but could have serious implications; for example, if a spill were to occur, the health of individual sharks, or the group as a whole, could be affected both directly through ingestion of oil and indirectly through disruption to food sources (DPAW, 2013). The risk for this to happen is however particularly higher for an oil spill containing crude oil than MDO that rapidly dilutes and evaporates in the water column.

Other species of sharks and rays could be present at low densities all year round within the OA and EMBA; however, the absence of any known feeding, resting or breeding areas means significant numbers are unlikely to be impacted if an unplanned release were to occur.

As the fish populations within the OA and EMBA are highly mobile pelagic species, it is unlikely that fish populations would be subjected to sufficient hydrocarbon contamination for periods long enough to result in mortality. Results of modelling demonstrate that there are no areas identified as exceeding the acute toxicity threshold of 400 ppb within the 0 – 20 m depth of water (the depth range likely to be exposed to dissolved fractions). Surface area exposed to moderate (50 ppb) are identified from Release Locations 1 to 5, but markedly decrease with increasing depth to 20 m. Predicted weathering and fate modelling shows that both dissolved and entrained hydrocarbons decrease rapidly within 3 – 5 days after release, with the bulk of spilled material being lost to evaporation and decay over time (RPS, 2023)

Fish populations are likely to be distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Combined with these factors and the rapid dispersion of marine diesel, the residual risk to fish species arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.3.2.4 Marine Reptiles

As summarised in **Section 4.5.5**, two species of endangered/migratory marine reptiles (loggerhead turtle, leatherback turtle), and three species of vulnerable/migratory marine reptile (green turtle, hawksbill turtle, flatback turtle) may be present within the EMBA.. No sea snake species were identified as potentially present.

The SEMR is not known to support breeding habitats for the turtle species identified in **Section 4.5.5**, and there are no BIAs for marine reptile species identified for the OA or EMBA, thus impacts to breeding habitat for marine turtles is not expected to occur.

Marine reptiles may be at risk from a hydrocarbon spill as they need to surface for breathing, and may be exposed to ingestion, inhalation and/or skin contact with hydrocarbons on the ocean surface. MDO has a low stickiness so it is unlikely to stick to turtles in large amounts and would likely wash of skin surfaces; however, MDO may cause skin irritation to sensitive organs such as eyes.

A hydrocarbon spill within the OA may result in impacts to individual marine turtles and a potential disruption to a portion of the foraging activities, however, this is not expected to result in a threat to the overall population viability due to the rapid dispersion of MDO. The residual risk to marine turtles arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.3.2.5 Marine Mammals

Marine mammals in the area could potentially ingest MDO when feeding in open water, or they could get coated with MDO when they surfaced to breath. However, given MDO has a low stickiness, it is likely that it would wash off the dorsal surfaces of cetaceans as they dived into deeper waters. MDO contact with sensitive body parts such as eyes may cause injury or damage and when cetaceans surface to breath, and there is the potential for volatile hydrocarbons to be inhaled. Hydrocarbons are fat-soluble and therefore tend to bioaccumulate before being eliminated by metabolism and excretion (Troisi *et al*., 2007). Physiological effects from internal contamination include dehydration, anaemia, organ damage, intestinal ulceration, immunosuppression, irritations and burns to mucous membranes (Balsiero *et al*., 2005). Cetaceans that spend extended periods of time at the sea surface will be particularly at risk to the effects of an MDO spill.

The north-eastern and north-western extent of the EMBA is shown to overlap areas identified as foraging BIAs for sperm and humpback whale. The overlap corresponds with the modelled entrained hydrocarbons in the low threshold range (10 ppb) with very low probabilities of occurring (3% chance for humpback foraging BIA and 1% chance for sperm whale foraging BIA), thus it is not expected to present either chronic or acutely toxic risks directly to these species, nor to their foraged food sources.

The pygmy blue whale distribution and foraging BIAs will be exposed in some way to hydrocarbons in the unlikely event of an oil spill. The foraging BIA has a high chance of being exposed to the high threshold of floating oil (50 g/m^2) from all Release Locations except 5, with the highest probability being 88% from Release Location 3. In terms of dissolved hydrocarbons, Release Location 4 is modelled to have the highest probably of the BIA being exposed to the moderate threshold (at 49%); however, the highest concentration was modelled at 358.1 ppb (below the high threshold of 400 ppb) from Release Location 2. The foraging BIA was modelled to have a high probably of exceeding the high entrained threshold (100 ppb) from each of the Release Locations.

The southern right whale breeding BIA was modelled to have a very low chance of exposure to the low threshold of entrained hydrocarbons, at 1% from Release Location 5, this not posing an ecotoxicological risk to biota. Other BIA features of the southern right whale (aggregation, migration, connecting habitat) may potentially be exposed to a range of hydrocarbon under worst -case spill scenarios. The duration of any such exposure is expected to be of minimal duration only (0.5 days maximum for surface exposure).

For Australian sea lions, foraging areas of the BIA are shown to overlap the EMBA (**Figure 26**). This overlap corresponds to a modelled exposure to entrained hydrocarbons up to a maximum of 106.4 ppb, thus not anticipated to pose a risk of chronic or acute direct (to the sea lions) or indirect (to food sources) toxicity.

For other marine mammals, species are expected to be present in the EMBA in low numbers and limited to isolated individuals or small pods. In the unlikely event of a spill occurring, they are not expected to remain in the vicinity of spilled hydrocarbons for extended periods. Although surface feeding cetaceans would be sensitive to a hydrocarbon spill, the residual risk of a vessel collision/refuelling incident and associated MDO spill on cetaceans has been assessed as **Low** (*minor x remote*) on account of their ability to metabolise hydrocarbons, low degree of adhesiveness of the MDO, and the fast dispersion and weathering of volatile hydrocarbons.

8.3.3.2.6 Seabirds and Migratory Shorebirds

Seabirds are susceptible to potential impacts at various exposure levels for surface oil through pathways such as a reduction in insulation and waterproofing, ingestion, impaired flight and navigation (AMSA, 2017). Depending on the length of time of exposure, especially in the case of areas of heavy oiling, direct contact with surface hydrocarbons can result in irritation of the skin and eyes and some individuals may die as a result of exposure.

Oiling, or external contamination of seabirds is particularly problematic and can lead to a loss of insulation, buoyancy, and the ability to fly or swim (as observed for penguins). Seabirds will groom/preen themselves in an attempt to remove any contamination, leading to ingestion and further toxicity effects from any MDO which might have adhered to their feathers. However, MDO has a dispersive nature, and the majority of seabirds are highly mobile so if any hydrocarbon was spilt, a significant/acute impact is unlikely.

In the highly unlikely event that a spill occurs in close proximity to the Victorian or Tasmanian coastline, MDO that reaches the shoreline may impact regionally significant resident breeding populations of seabird and migratory shorebird species (refer to **Table 30**, **Section 4.5.7** for species details).

Nine and 24 seabird species are identified as having breeding and foraging habitat BIAs, respectively, relevant to the Otway Basin 3D MC MSS, based on the results contained within the EPBC Act Protected Matters Report (see **Section 4.5.7**). Two species are identified as having migration/aggregation BIA habitats overlapping with the EMBA.

Although oceanic seabird species can travel long distances to forage in offshore waters, most breeding seabirds tend to forage in nearshore waters near their breeding colony, resulting in intensive feeding by higher seabird densities in these areas during the breeding season and making these areas particularly sensitive in the event of a spill.

For areas identified as a breeding BIA, these are located on shoreline areas, that in the event of an oil spill, may be at risk of exposure to shoreline hydrocarbons. Breeding habitats identified for several seabird species on Philip Island (e.g. little blue penguin, short-tailed shearwater) and the smaller islands off the north west TAS peninsular (short-tailed shearwater) may be susceptible to exposure to low to moderate shoreline hydrocarbon thresholds of exposure. Whilst exposure of nests and eggs to direct hydrocarbon exposure is extremely unlikely given nesting is likely to occur above the high tide range of any potential shoreline accumulation, the likely higher density of birds during nesting, and increased foraging intensity may be at risk to exposure of any shoreline or nearshore water hydrocarbon exposure.

Foraging habitats across many species may be exposed to entrained hydrocarbon exposure. Potential risk of exposure to entrained hydrocarbons in the high threshold is predicted to be of a short duration (several days) under a worst-caste spill scenario, with the bulk of hydrocarbons being lost to evaporation and degradation over time.

Shorebirds foraging for food in intertidal areas or along the high-tide mark may encounter weathered hydrocarbons, subsequently returning to the next and/or ingested. However, by the time this may occur, the hydrocarbons are expected to be heavily weathered and likely to permeate through the sandy areas, limiting the potential accumulation on adult birds. Potential toxicity effects from ingestion of weathered hydrocarbons are not expected due to the properties of MDO, with the volatile aromatics evaporating rapidly after a spill event.

The residual risk to seabirds arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.3.3 Potential Impacts and Risks to Cultural and Heritage Sites

Section 4.6 details the extent of the EMBA that overlaps or is in close proximity with the Native Title Determination Areas, namely areas on the VIC coastline (Gunditjmara and Eastern Maar, Gunditjmara (Part A), Eastern Maar People, Gunai/Kurnai People). There are four protected shipwrecks within the OA, and numerous submerged shipwrecks across the extent of the EMBA overlapping VIC, TAS, NSW and South Australian waters. There are eight Heritage River/Sites identified as overlapping with the EMBA.

Native Title Determination Areas are not shown to extend beyond 200 m into the coastal waters. Shoreline exposure of the coastline intersecting Native Title Determination Areas along the west VIC coastline (Otway to South Australia) from an oil spill may result in exposure to low-moderate thresholds of hydrocarbon exposure, with isolated pockets at Glenelg and Corangamite (west of the Otway) potentially exposed to high thresholds of shoreline hydrocarbons. The probability of this occurring is low (1 – 2% for Corangamite and Glenelg, respectively), estimated to extend over ~1.9 km in the length of the shoreline (RPS, 2023).

Any potential hydrocarbon release is expected to undergo significant physical dispersion and dissolution, prior to any amount being beached. Any potential beached amount is expected to be occur in the mid to low threshold range of hydrocarbon exposure. Natural weathering/attenuation processes are anticipated to adequately mitigate any residual risk of beached oil droplets at these remote locations. Submerged shipwrecks within the OA and on the outer edge of the EMBA are not anticipated to be exposed to surface oil plumes and predicted low concentrations of dispersed/entrained oil to these will not be expected to incur any adverse effects.

The residual risk to cultural/heritage areas arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Seismic Survey has been assessed as **Low** (*minor x remote*).

8.3.3.4 Potential Impacts and Risks to Coastal Marine Environment

8.3.3.4.1 Key Ecological Features

The OA overlaps with one KEF, the West Tasmania Canyon KEF. In addition to the West Tasmania Canyon KEF, the EMBA also overlaps with the following additional KEFs:

- Bonney Coast Upwelling;
- Big Horseshoe Canyon;
- Canyons on the Eastern Continental Slope;
- Seamounts South and East of TAS; and
- Upwelling East of Eden.

Across all KEFs, interactions with any spilled hydrocarbons are anticipated to occur to some degree but are anticipated to be restricted to the surface waters, and impacts will decrease markedly with increasing depth. Interactions and any impacts are likely to be restricted to planktonic assemblages in the water column only, and sensitive ecological receptors at depths are highly unlikely to be impacted by any spilled oil. Modelled distribution of entrained oil shows high threshold in the top 10 m of water intersects with the Bonney Coast Upwelling and West Tasmania Canyons KEFs, but this does not extend to deeper waters beyond 20 m. With rapid loss of the bulk of any spilled oil to evaporation and degradation, modelling suggests that for a worst-case spill, between 9 – 11% of the total volume may remain entrained in the water column (RPS, 2023).

8.3.3.4.2 Australian Marine Parks

The OA overlaps two AMPs and the EMBA overlaps with a further eight AMPs. As with KEFs, the greatest risk of exposure to spilled oil for AMPs in the vicinity of the OA is to water column exposure in the top 10 m of water. Deeper waters, and sensitive benthic environments associated with the AMPs are not anticipated to be exposed to thresholds of dissolved or entrained water that pose an ecological risk. Modelled results of worst-case scenarios demonstrate that surface waters across the AMPs are not at risk of exposure to floating surface oil but may be exposed to low to moderate thresholds of dissolved hydrocarbons. The probability of exposure of the Apollo, Zeehan, and Franklin AMPs to moderate (>50 ppb) thresholds of dissolved hydrocarbons is predicted to be low (1 – 6%) (RPS, 2023).

The Apollo, Franklin, and Zeehan AMPs are also predicted to be exposed to high thresholds of entrained hydrocarbons in the event of a worst-case spill from Release Locations 3, 5, and 4, respectively. As with the risk to KEFs, entrained hydrocarbons decrease significantly with depth, and any residual hydrocarbons are highly unlikely to incur any long-term effects to benthic communities in deeper waters across the AMPs.

The Hogan Island and Kent Island Group in the Beagle AMP (in Bass Strait) are at risk of exposure to low threshold shoreline hydrocarbon accumulation from a worst-case oil release. The probability of this occurring is, however, low, and depends on the location of the spill event. With natural weathering and degradation, persistent adverse ecological effects are not expected to occur.

8.3.3.4.3 Other Sensitive Areas

Across the EMBA, other sensitive areas include Ramsar Wetlands, Nationally Important Wetlands, and Threatened Ecological Communities. Assemblages of species commonly associated with Ramsar sites and nationally Important Wetlands are those associated with open-coast-salt-wedge estuaries, as described in **Section 4.4.10.1**.

Location of Ramsar and Nationally Important Wetlands may be exposed to low-moderate thresholds of shoreline oil accumulation in the event of a wors-case oil spill. Western Port, Bellarine Peninsular, and Piccaninnie Ponds Karst Wetlands are potentially susceptible to shoreline accumulation of low-moderate shoreline thresholds.

Exposure to dissolved hydrocarbons is not predicted to occur across Ramsar or Nationally Important Wetlands, but exposure to low thresholds of entrained hydrocarbons may occur at low thresholds (10 ppb) (Corner Inlet, Lavinia, Port Philip Bay and Bellarine Peninsular), and to moderate thresholds (100 ppb) (Glenelg Estuary and Discovery Bay Wetlands, Piccaninnie Ponds Karst Wetlands). The probability of exposure of Ramsar wetland locations to moderate entrained thresholds is very low (1 – 2%) (RPS, 2023).

Giant Kelp forests located in TAS coastal waters (and some remnant patches in VIC and SA) occur subtidally, in waters typically deeper than 8m, and associated with moderate wave exposure (DoCCEEW, 2012). With a dense canopy extending upwards to surface waters, in the event of a worst-case oil spill, the surface extent of any canopy may be exposed to shallow dissolved and entrained hydrocarbon fractions. Results of stochastic modelling indicates TAS nearshore western coastal waters may be exposed to moderate thresholds of entrained hydrocarbons in the surface waters (0-10 m), thus any Gian Kelp canopy extending to shallow surface waters may also be exposed to moderate entrained hydrocarbon thresholds. Deterministic analysis (for Release Location 5, closest to the TAS west coast) predicts 10% of a maximum worst-case spill to remain in the water column after a 50-day modelled simulation. Any residual amount after this 50-day period is expected to exhibit low toxicity thresholds, given the predominant toxicity of MDO is associated with dissolved fractions which rapidly evaporate and attenuate in the receiving environment. Exposure to dissolved MDO is predicted to be in the low threshold range for any nearshore coastal waters along the northwest TAS region. Toxicity at this range, and up to the moderate threshold, is minimal and short lived.

Based on the above and including numerous control measure (**Section 8.3.6**) to be implemented, the residual risk to the coastal marine environment from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*minor x remote*).

8.3.4 Evaluation of Known and Potential Impacts and Risks to Relevant Persons

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 124**.

Table 124 Relevant Persons Assessed

Receptor	Section reference
Commercial fisheries	**Section 8.3.4.1**
Commercial shipping	**Section 8.3.4.2**
Tourism and recreation	**Section 8.3.4.3**

Commercial fisheries and coastal shipping operations are considered the most at risk of vessel collisions due to their presence in, or transiting through, the OA. Due to the low potential volumes of an MDO spill that could result from a collision/sinking event, socio-economic impacts on existing interests are likely to be low.

There may be some temporary disruption to fishing activities if a spill occurred and entrained or surface hydrocarbon plume moved through a fishing ground, where it could have the potential to coat the buoys and ropes of fish or rock lobster pots. In the worst-case, larval stages of commercially targeted fish species (e.g. blue warehou, blue grenadier, orange roughy, southern rock lobster, abalone, scallop and squid, see **Section 4.8** for full details) may be affected. Larval stages of other important demersal and pelagic fish species may also be affected, depending on time of the year and location/scale of any potential spill event.

Outcomes of modelled exposure pathways suggest that under a worst-case spill scenario, by the time any MDO made it to shore, for some areas of the VIC and TAS shoreline, it may be at moderate exposure thresholds (10 – 100 g/m^2) that may incur adverse effects. For the VIC coastline from Wilson Promontory, extending west to the South Australian border, low threshold shoreline exposure levels may be indicative of 'perceived' impacts, and there is the potential for some socio-economic impact (visual/aesthetic).

As noted earlier, smaller sections on the west coast of King Island (along with the Corangamite shoreline) may be at risk of exposure to high threshold shoreline accumulation under a worst-case spill scenario. For King Island, this is of high importance for the management of risks to commercial bull kelp harvesting operations (**Section 4.7.3.4.6**).

The most obvious effect from a vessel collision/sinking to existing interests in/around the OA is the potential for casualties and injury. Released debris may float, either at the surface or partially submerged, creating a navigation hazard to other users of the marine environment, while MDO released from the vessel(s) will likely disperse and weather with time, unless making landfall where risks to the public could occur.

8.3.4.1 Potential Impacts and Risks to Commercial Fishing

Following a collision/sinking large debris that settles on the seabed, such as a vessel itself, pose a risk to commercial trawl fisheries. Trawling would not be safe around such debris as trawl gear may become entangled. Zones identified as low to high trawling effort are identified in the northwestern and eastern edge of the OA.

Potential effects of a hydrocarbon spill (such as MDO) on fisheries include effects on fish populations, contamination of equipment (e.g. nets, and boats), displacement from fishing grounds, contamination of catch, loss of revenue from disruption, and negative public perception of fish quality and safety of target species. Given the low volume of MDO that might potentially escape in the event of a collision/sinking, the likely impacts to commercial fisheries would be relatively short-lived, and reasonably localised around the vessel collision/sinking location.

Effects of MDO contamination of oil on submerged kelp forests include tissue damage with bleaching being the most visible indication of plant contact with oil, reduced photosynthesis, and, in the case of heavy oiling events, breakage of kelp fronds (Antrim *et al*., 1995). For commercial marine plant fisheries (formerly kelp fisheries, see **Section 4.7.3.4.6**), any worst case-spill that results in shoreline accumulation of oil along the west coast of King Island, or north-western TAS shoreline, may require the temporary cessation of shoreline harvesting operations until the outcomes of the OPEP (and any response under the OSMP) are known. Commercial kelp harvesting is currently a shoreline/land-based activity. Result of stochastic modelling predict under a worst-case oil spill scenario, shoreline accumulation of oil on the western King Island shoreline has a 3% probability of exceeding the shoreline high threshold, from a worst -case spill from Release location 4, and a 1% probability of exceedance for a worst-case spill from Release location 3 (RPS, 2023). Overall (averaging over the modelled scenarios across an annual period), shoreline oil accumulation across west coast King Island is predicted to affect up to ~47 km of the shoreline at the low exposure threshold, and up to ~2 km of the shoreline at the high exposure threshold.

Any fishing equipment such as nets and lines that contacts a spill may become fouled by hydrocarbons, for example fishing nets towed through spill areas or lifted through surface slicks. However, it is highly unlikely that fishermen will knowingly enter into a spill area, making fouling of equipment unlikely. A more likely effect comes from displacement of fishing vessels from regular fishing grounds, possibly reducing the potential of a vessel to catch their quota or increasing the time and fuel consumption costs by having to travel to other unaffected fishing areas.

Visible hydrocarbons on the sea surface may persist for several days so any potential closures will be temporary (for example 1 – 2 weeks) and will be dependent on the outcome of the spill response process (**Section 10.10**). Economic impacts from loss of revenue and profit due to inability to fish in certain areas following a hydrocarbon spill will initially impact the fishing companies. However, trickle-down effects also occur, with the potential for employees to suffer from loss of wages and job cuts (McCrea-Strub *et al*., 2011), as well as sub-contractors and supply companies becoming effected.

Under the ‘Commercial Fisheries Compensation Protocol for the Otway MC3D Marine Seismic Survey’, commercial fishers may lodge a claim for compensation to be paid as a result of economic losses due to displacement from ‘usual fishing grounds’ as a result of avoiding contaminated waters following a fuel oil spill. Further details on the commercial fisheries protocol are provided in **Section 7.2.3.1.**

The residual risk to commercial fisheries arising from an accidental release of MDO as a result of a vessel collision/refuelling incident during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor x Remote*).

8.3.4.2 Potential Impacts and Risks to Commercial Shipping

With a major port at Portland on the VIC coastline, heavy vessel traffic in the northwestern extent of the OA, and inshore to the coast is expected, due to vessels heading towards Portland and the major adjoining ports in Port Philip Bay and Port of Devonport (TAS) (refer to **Section 4.7.4**). Traffic within the majority of the OA itself is relatively low (in comparison to the northern extent).

In the event of a vessel collision and significant marine diesel spill, the AMSA JRCC may issue a warning to shipping traffic in the area to avoid the incident location. Exclusion zones surrounding a spill will reduce access for shipping vessels for the duration of the response undertaken for spill clean-up (if applicable); vessels may have to take detours leading to potential delays and increased costs.

Debris left floating in the ocean following a vessel collision/sinking provides a hazard to marine shipping traffic and may force vessels to reduce speed in the known area of a debris field, or alter courses to avoid the area, reducing efficiency. This would be advised via safety communications and Notices to Mariners to alter regular routes to avoid movement through contaminated areas and areas involving clean-up activities. This impact would apply to both offshore and coastal routes.

Due to advance communications and vessel's ability to alter course to avoid floating debris and/or hydrocarbon spills, the environmental risk and subsequent effect of a vessel collision/sinking on commercial shipping would be **Low** (*minor x remote*).

8.3.4.3 Potential Impacts and Risks to Tourism and Recreation

As described in **Section 4.7.2**, the SEMR offers a wide and diverse range of opportunities for marine based tourism and recreational activities, including snorkelling, scuba diving, surfing, kayaking, whale and wildlife watching, sailing and charter boat cruises. Popular tourist destinations include Phillip Island and the Great Ocean Road (VIC), Robe and Beachport (South Australia) and Strahan and the Freycinet Peninsula (TAS) (CoA, 2015).

Tourism and recreational activities in the region occur predominantly in State waters adjacent to population centres/coastal settlements. Charter vessels may occasionally transit through the EMBA, however interactions with the Otway Basin 3D MC MSS are considered unlikely due to the offshore location of the OA. Whale watching activities are largely undertaken from shoreline-based locations, with occasional vessel and aircraft. Recreational diving is largely confined to nearshore water depths of 30 m or shallower, thus out of the depth and vicinity of the OA. Similarly, surfing, recreational boating and fishing are largely confined to the nearshore state waters, and are not likely to overlap with the OA.

Risks of entrained or shoreline hydrocarbons potentially pose the greatest risks to tourism and recreational activities, through the physical presence of the oil in the water column (entrained) and risks of shoreline accumulation. As described in **Section 8.3.2**, in the event of a worst-case oil spill, the shoreline across the VIC and TAS coastlines are susceptible to low-moderate thresholds of hydrocarbon exposure, and in isolated pockets to high-thresholds of exposure (at Corangamite and King Island). Exposure to high thresholds of entrained hydrocarbons are predicted to occur in nearshore waters of King Island and Glenelg, with the wider extent of the EMBA subject to a range of moderate to low exposure thresholds.

Debris released from a collision/sinking may pose a temporary and localised navigational risk to recreational and tourism vessels plying the coastal waters and drifting or washed-up debris could have negative effects on the aesthetic qualities of the area for tourists. Effects of a hydrocarbon spill on tourism and recreational activities include lost abilities to carry out activities due to loss of habitats, displacement of tourism/recreational vessels from areas (e.g. within oil slicks and during clean-up activities), displacement of marine organisms (which may have attracted tourists) by presence of slicks, and loss of revenue from changes in public perception including reduced aesthetic qualities of coastal environments where hydrocarbons land or persist. As a result of these potential impacts to tourism and recreational activities if a spill occurred, the impacts are considered to be **Low** (*minor x remote*).

8.3.5 Decision Context

The decision context for vessel collision, sinking and bunkering and any associated hydrocarbon spill has been assessed as Type A given the predicted impacts and risks are well understood and uncertainty is minimal.

8.3.6 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

The potential control measures implemented during the Otway Basin 3D MC MSS to manage any potential impacts and risks from vessel collision, sinking, bunkering incidents and associated hydrocarbon spill to **ALARP** have been included in **Table 126**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction (**Table 126**), based on a Hierarchy of Controls methodology (**Table 125**). These control measures have been assessed to consider the environmental benefits gained through implementing the controls and characterised as effective and practicable to implement.

Table 125 Hierarchy of Control Measures for Vessel Collision, Sinking, Bunkering and Associated Hydrocarbon Spill

Eliminate	The use of vessels cannot be eliminated as a Seismic Vessel must be used to undertake the required data collection. The OA is also an open ocean area where other vessels (fishing, shipping, cargo, recreational) are not restricted from entering and may pass through any part of the area (within reason) at any time thus other vessels cannot be eliminated either. A Support Vessel is also needed for several reasons and cannot be removed from the operations. Refuelling at sea cannot been eliminated from the Otway Basin 3D MC MSS, thus this source of risk cannot be eliminated. Refuelling at port would incur more frequent vessel movement and increase the risk of vessel collision. The consequence of vessel collision and associated hydrocarbon spill are higher than those associated with potential hydrocarbon loss associated with refuelling at sea.
Substitute	There are no suitable substitutes for use of a Seismic Vessel to undertake the survey in the required location.
Reduce	TGS aims to reduce the amount of time the vessels are in the OA by working 24/7 whenever possible. Reducing the number of vessels by removing the presence of a Support Vessel could reduce the risk of a collision/sinking. But at the same time this reduction could increase the risk of a collision between other vessels and the Seismic Vessel and/or its towed equipment. Thus, a reduction in the number of vessels isn't a practicably feasible option. Refuelling at sea will occur approximately every 2 - 6 weeks, undertaken within the OA, and to be kept to a minimum to reduce vessel traffic.
Mitigate	Control measures have been assessed within **Table 126** in order to mitigate the impacts from a possible vessel collision/sinking to **ALARP** levels. Those which are appropriate and are not impracticable or unfeasible due to disproportionately large costs will be implemented during the Otway Basin 3D MC MSS.

Table 126 Assessment of Control Measures for Vessel Collision, Sinking, and Bunkering and Associated Hydrocarbon Spills

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of vessel collision, sinking and bunkering and associated hydrocarbon spills.	Yes
All survey vessels will adhere to the requirements of the national and international legislation, including the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of Safety of Life at Sea (SOLAS) as implemented in Commonwealth Waters through the Navigation Act 2012 and associated Marine Orders 21, 30, 91 and the STCW Convention. The requirements give effect, but are not limited to, the following: • Appropriate lighting, navigation and communication to inform other marine users; and • Use of radar and 24/7 watch.	P = Yes E = Effective	At all times during the survey the crew of the survey vessels will comply with COLREGS, including maintaining a visual watch and undertaking a full radar scanning watch for the presence of any other vessels in close proximity or any vessel on a course heading towards them or the other vessel involved in the Otway Basin 3D MC MSS. Early detection of approaching vessels will allow the survey vessels to attempt to communicate with approaching vessels to avoid chances of collision. The slow speed of the vessels during the operational phase of the survey (4 – 5 knots) will then also allow the vessels plenty of time to attempt communication following early detection and if required make appropriate evasive manoeuvres. In addition to the above, having navigational lighting and day-shapes compliant with COLREGS for safe passage at sea and specific to each vessel and its activities will provide further means in reducing the chance of vessel collisions. In accordance with Marine Order 91, if a MDO spill does occur following a vessel collision/sinking TGS will implement the response strategy in accordance with the SOPEP, and also in line with relevant legislation and industry standards. TGS will also undertake all required notification and reporting during planning stages of mobilisation phase of survey. In the event of a vessel collision/sinking and there is a resultant MDO release, notification will be provided to AMSA and regulatory agencies in accordance with the Implementation Strategy – Reporting **Section 10.6**	Yes
Vessels over 400 gross registered tonnage hold and approved and tested SOPEP, with crew trained in its implementation.	P = Yes E = Effective	This control measure meets the requirements of Annex I of MARPOL which requires vessels over a certain size to have a SOPEP. Having crew trained in the implementation of the SOPEP will reduce the likelihood of a spill response option being required, by reducing the likelihood of a spill occurring in the first place. The Vessel Master is responsible for activating and implementing the vessel SOPEP. Prior to the commencement of survey operations, the SOPEP will be tested including testing of communications and a vessel-based drill in hydrocarbon spill response. It is a legislative requirement for vessels to comply with MARPOL.	Yes
In the event of a spill to the marine environment, the OPEP will be implemented.	P = Yes E = Effective	In accordance with the requirements of the Environment Regulations, an OPEP accompanies this EP, which details the spill preparedness and response arrangements that will be implemented in the event of a spill. The OPEP includes arrangements for notifying AMSA and engaging the National Plan resources.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Good Industry Practice:			
Vessel will only utilise MDO. Vessel fuel to be stored in compartmentalised and/or multiple separate onboard fuel tanks.	P = Yes E = Not Effective	Utilising a certain type of fuel is not effective in reducing the risks of a vessel collision and hydrocarbon spill, but it is important for considering the types of responses required for clean-up. Utilising MDO would have less impacts on the marine environment should a spill occur compared to other heavier oils and the same level of response would not be required for the clean-up. Finally, this fuel type is consistent with that which for which the impacts have been modelled. Fuel systems onboard the survey vessels (carrying MDO) will consist of multiple smaller tanks throughout the vessel or larger tanks built of multiple separate compartments. This will reduce the potential volumes of MDO that could be released to the environment in the event of a tank being ruptured during a collision/sinking event. Good industry practice, environmental benefit outweighs additional cost.	Yes
Refuelling will occur away from the Zeehan AMP and the Nelson AMP.	P = Yes E = Effective	Refuelling will not occur within 5 km of the Zeehan Marine Park or Nelson Marine Park, as shown in **Figure 92**. These separation distances will minimise the risk of adverse effects occurring on the values present in these higher risk areas. Environmental benefit outweighs additional cost.	Yes
Appropriate use of radio communication at sea.	P = Yes E = Effective	Survey vessels will keep open radio communications between each other as well as scanning local working channels and the emergency channel (VHF 16) for contact with other vessels that may be operating in the vicinity, and therefore reduce the potential for collision. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
Utilising accurate weather forecasting information for planning operations.	P = Yes E = Effective	TGS will subscribe to a weather monitoring service that will provide updated forecasts (including wind, waves/seas and currents) four times daily allowing vessel masters to best plan the vessels movements and operations to occur when and where in the OA the weather is safest/most-suitable. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
Contract in place with appropriate service provider to initiate real-time modelling in case of a spill.	P = Yes E = Effective	Undertaking real-time modelling will provide assurances that response options can be tailored to the specific spill situation. The modelling will be based continuous weather monitoring which will be utilised in conjunction with hindcast data to predict the potential beaching locations (if any exist).	Yes
In case of a spill <10m^3, TGS will implement relevant Type I Operational Monitoring.	P = Yes E = Effective	Type I Operational Monitoring (such as using the Support Vessel to monitor the spill) will be undertaken in the unlikely event of a hydrocarbon spill to provide up-to-date information on the fate of hydrocarbon in the water. This monitoring will allow appropriate response options to be established with the Controlling Authority. Good industry practice, safety benefit outweighs additional cost.	Yes
Type II Scientific Monitoring undertaken (informed by updated NEBA/Spill Impact Mitigation Assessment (**SIMA**)) in case of spill if real-time modelling shows the spill will impact land, in consultation with the CA.	P = Yes E = Effective	Depending on the fate of any hydrocarbon spill, based on the real-time modelling and operational monitoring described above, Scientific Monitoring may be required (if directed by the Controlling Authority) to monitor the impacts from a spill occurrence. Good industry practice, environmental benefit outweighs additional cost.	Yes
Hydrocarbon spill response training and competencies will be maintained throughout the Otway Basin 3D MC MSS to avoid unplanned environmental impacts due to human error.	P = Yes E = Effective	Ensuring all staff members have appropriate training is vital in responding to a hydrocarbon spill. Drills will also be undertaken to ensure all staff are competent in responding to spills under the vessel specific SOPEP; these drills will be conducted at regular intervals to ensure the competencies are maintained throughout the operation. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
AIS transponders fitted to survey vessels and tail buoys.	P = Yes E = Effective	AIS transponders will transmit key information to all vessels able to receive AIS data and will include details such as vessel GPS position, identity, type, speed, course and caution notes). The AIS system will also receive AIS information from other vessels in the area. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
All crew will participate in the vessel and environmental induction prior to the commencement of operations.	P = Yes E = Effective	It is a standard industry practice to hold inductions for all onboard the vessels, with participation in induction meetings compulsory. During inductions, crew will be made aware of their responsibilities with regard to effects of discharges to the marine environment and their roles with regard to clean-up of any accidental discharges. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
Spill response equipment will be available and maintained onboard each vessel and located in close proximity to hydrocarbon areas and crew onboard will be trained in how to respond to any incident utilising the response equipment available.	P = Yes E = Effective	The availability of spill response equipment in close proximity to any hydrocarbon areas allows a quick response to any hydrocarbon spills into the marine environment. Vessel master will authorise actions in accordance with the vessel-specific SOPEP and the survey specific OPEP to limit the escape of hydrocarbons. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
Undertake hydrocarbon spill modelling prior to EP submission.	P = Yes E = Effective	A hydrocarbon spill modelling prior to the submission of this EP has been undertaken and was considered being useful to map the potential risks of vessel collision and hydrocarbon spills. As the OA covers a very wide area it is difficult to determine the ideal location to base the modelling on, thereby the spill modelling was undertaken at five different locations (see method and results in **Section 8.3.2**). As outlined in the control measures to be implemented above, TGS will also implement real-time modelling in the event of a spill which will provide more detailed and realistic areas of potential beaching along the coastline to assist in responding to a spill occurrence. Good industry practice, environmental benefit outweighs additional cost.	Yes
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	P = Yes E =Effective	A communications protocol will be in place which details the methods used to contact third-party vessels prior to commencement of the Otway Basin 3D MC MSS, throughout the survey duration, and following completion of the survey, and those identified only once at sea, to actively manage concurrent activities. Communication with relevant persons allows those potentially affected by the Otway Basin 3D MC MSS to plan activities in a manner that reduces the risk of interactions with the survey vessels and towed equipment (e.g. commercial fishers can avoid deploying gear in the path of the Seismic Vessel). TGS will provide a daily 'look-ahead' plan, which details the proposed operations for the next 48-hour period. Information regarding proposed operations will include, as a minimum, the current positions of the survey vessels and the proposed timing and location of operations for the following 48 hour period. These will be provided daily to those relevant persons who register for the service. As part of this communication, TGS will request information from commercial fisheries on upcoming fishing activities for the next 24 – 48 hours. This will allow the Seismic Vessel to consider alternative lines, where practicable. The Seismic Vessel will change sail lines to accommodate commercial fishers' requests if it is feasible to do so, providing there is open and advanced communication from the commercial fishing operator of their intention to fish at a specified location, no other environmental performance commitments in this EP conflict with a change in sail lines, and providing TGS is afforded a reasonable opportunity to complete the Otway Basin 3D MC MSS in a timely and efficient manner. This control measure has been proposed in response to consultation with relevant persons. Good industry practice, safety benefit outweighs additional cost.	Yes
Notification to the AHO for the publication of a Notice to Mariners of survey presence and towed array, no less than four weeks before operations commence.	P = Yes E = Effective	Under the Navigation Act 2012, AHO can publish and distribute a Notice to Mariners. This Notice outlines potential hazards and restrictions to relevant persons. AHO will be contacted four weeks prior to the commencement of the survey for the publication of related Notices to Mariners. Good industry practice, safety and socio-economic benefit outweighs additional cost.	Yes
Notification to the JRCC for the promulgation of navigational warnings (i.e AUSCOAST warnings)	P = Yes E = Effective	The JRCC will be contacted 24 – 48 hours before operations commence for issuing of radio-navigation warnings. This will ensure that commercial fishers are aware of the Otway Basin 3D MC MSS. Implementation will reduce the likelihood of interactions with commercial fishing vessels. Good industry practice, safety benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Notification to the DNP in the event of an oil spill.	P = Yes E = Effective	The DNP should be made aware of unplanned events such as an oil spill which occurs within an AMP, or is likely to affect any AMPs, as soon as possible. Parks Australia plays a role in the National Plan for Maritime Environmental Emergencies. The DNP should be notified through notification to the Marine Park Compliance Duty Officer (0419 293 465). Notification should include: titleholder details, time and location of the incident, proposed response arrangements and locations as per the OPEP, and contact details for the response.	Yes
At least one Support Vessel will accompany the Seismic Vessel when in operation and when safe to do so (e.g. outside of inclement weather periods), to manage interactions with other marine users.	P = Yes E = Effective	Support vessels (Support Vessel and Chase Vessel) will be present around the Seismic Vessel to intercept other vessels in the area that are at risk of interacting with the Seismic Vessel and/or equipment. This is a health and safety requirement and is standard practice for all MSSs. Implementation will reduce the likelihood of interactions, reducing the potential for a vessel collision. Good industry practice, environmental and safety benefit outweighs additional cost.	Yes
Seismic survey vessel contractor procedures include requirements to be implemented during refuelling operations, including: • A completed Permit to Work; • A Job Safety Analysis (**JSA**) implemented for bunkering operations; • Visual monitoring of gauges, hoses, fittings; • Sea surface bunkering; • Hose checks prior to commencement; • All crew are spill response trained; and • Spill response equipment is nearby, easily accessible and fully stocked	P = Y E = Effective	Each survey vessel will have refuelling and bunkering procedures outlining the steps to be taken during refuelling operations to ensure this is carried out in a safe manner and without incidents.	Yes
Dry-break couplings will be installed on refuelling hoses.	P = Y E = Effective	Dry-break couplings will be used to reduce the risk of a refuelling incident from occurring. Good industry practice. Environmental benefit outweighs additional cost.	Yes
At sea refuelling operations will only take place during daylight hours and within strict weather limit guidelines.	P = Yes E = Effective	Refuelling will only be undertaken during daylight hours and appropriate weather/sea conditions. Implementation of this control will reduce the risk of a refuelling incident from occurring. By limiting refuelling to daylight hours also reduces the likelihood of a spill entering the marine environment. Environmental benefit outweighs additional cost.	Yes
Alternatives/Substitutes Controls Considered:			
Eliminate vessels.	P = No E = Very Effective	There are no practicable methods for undertaking the Otway Basin 3D MC MSS without the use of vessels.	No
Eliminate presence of other hydrocarbon fluids onboard vessels (e.g. lubricants, hydraulic fluids).	P = No E = Effective	Lubricating and hydraulic fluids are required for the normal operation and maintenance of the vessels and equipment and as such cannot be completely eliminated. Storage in suitably bunded areas as detailed above will reduce risk associated with these fluids. Lubricating oils and hydraulic fluids are typically stored in 50 – 200 L steel drums either in a designated storage room, or a bunded area on deck. Therefore, any potential spills of these substances on deck are likely to be <200 L in a contained area. Hydrocarbons which occur in greater (>200 L) quantities on the vessels, for example waste engine oil, hydraulic fluid and main engine lubricating oils, are generally stored in designated storage tanks below deck and therefore are unlikely to be a direct hazard for deck spills (unless smaller quantities have been transported to the deck to be used for deck activities). It is possible that spills or leaks from hydraulic hoses on hydraulically operated equipment such as cranes and winches may occur, but if so, the fluid is likely to be contained within a bund or drip tray, and the volume of fluid loss will be low (<1 L). It is therefore highly unlikely that a non-contained spill of hydrocarbon fluids will occur onboard vessels; however, should such fluids enter the marine environment, their impact is likely to be low-minimal as the small volumes will quickly evaporate, disperse and weather.	No

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Substitute MDO for an alternative fuel or wind-powered vessels.	P = No E = Not Effective	MDO is already a vast improvement over HFO, and lighter alternative fuels or wind power are not feasible to use in the vessels that will be utilised for the survey as they have not been commercially proven for use in large vessels. It is expected that the high energy marine environment in which the OA is located will aid in the rapid dispersion (in the direction of the prevailing wind and current) and evaporation of MDO should it enter the marine environment. Warmer water temperatures during summer months will further accelerate this process.	No
No refuelling will occur at sea.	P = No E = No	Refuelling operations are one of the most likely causes of a hydrocarbon spill occurring during marine operations. However, given the offshore location of the OA this activity cannot be removed from the operation of the Otway Basin 3D MC MSS. It is not considered a practical option and given the probable increase in vessel activity associated with bunkering, it is not considered effective at significantly reducing risk. The removal of this activity would reduce the potential risk of a hydrocarbon spill occurring in the first place, and the potential impacts of a spill on the environment. Removing the refuelling operations at sea from the Otway Basin 3D MC MSS will potentially increase the risks to the health and safety of employees.	No
Additional Control Measures Considered:			
Use a Seismic Vessel with smaller fuel and oil tank sizes.	P = No E = Effective	This would mean more frequent trips to port for refuelling which would increase costs and the duration of the survey, as well as result in greater risks. Furthermore, implementing this control measure would likely lead to a delay in the timing of data acquisition due to the time needed to contract an appropriate Seismic Vessel. Data delivery to clients would consequently be delayed and requirements not met.	No
The Otway Basin 3D MC MSS will be restricted to daylight hours.	P = No E = Effective	The cost of the survey would increase substantially as the survey duration would double. Health and safety risks and potential impacts to marine life (e.g. cetaceans) would also increase due to the longer survey duration.	No
Reduce size of the OA to decrease chance of spills reaching emergent lands.	P = No E = Effective	The size of the OA has already been reduced substantially. Further reductions would result in TGS being unable to fulfil primary objectives of the survey and data requirements. The likelihood of vessel collision or sinking and an associated hydrocarbon spill is extremely unlikely and is no greater than that for other vessels that may enter the OA and surrounding waters.	No
Dedicated spill response vessel and resources on standby.	P = No E = Effective	The option of having a dedicated spill response vessel on standby for the Otway Basin 3D MC MSS was discounted on the basis that the cost would be grossly disproportionate to any reduction in risk which is already determined to be low, particularly as the expected behaviour of an MDO spill would limit the effectiveness of on-water response options. Additional vessels could also increase the risk of interference and potential for collisions.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Risk Ranking**
Marine environment quality	Minor	Remote	Low
Benthic invertebrates	Minor	Remote	Low
Zooplankton, fish eggs and larvae	Minor	Remote	Low
Bony fish and elasmobranchs	Minor	Remote	Low
Marine reptiles	Minor	Remote	Low
Cetaceans	Minor	Remote	Low
Seabirds and migratory shorebirds	Minor	Remote	Low
Cultural and heritage sites	Minor	Remote	Low
Marine Protected Areas	Minor	Remote	Low
Commercial fisheries	Minor	Remote	Low

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Commercial shipping	Minor	Remote	Low
Tourism and recreation	Minor	Remote	Low
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to be **Low**. TGS considers the adopted control measures are sufficient to minimise the risk of impacts from a vessel collision, sinking, and bunkering incidents and associated hydrocarbon spill are appropriate to the nature and scale of the predicted environmental impacts. The proposed control measures have been developed in accordance with Good Industry Practice and legislative requirements, and taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Additional control measures were considered as part of the assessment process; however, it was considered that they did not provide any further environmental benefit or were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from a vessel collision and associated hydrocarbon spill are reduced to **ALARP**.			

8.3.7 Impact and Risk Acceptability

Table 127 Demonstration of General Risk Acceptability for Vessel Collision, Sinking, and Bunkering and Associated Hydrocarbon Spill

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to be Low.
Ecologically Sustainable Development	The management of the impacts associated with vessel collision, sinking and bunkering incident and associated impacts (e.g. hydrocarbon spill) can be carried out in compliance with principles of ESD as defined within the EPBC Act. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	In the remote likelihood of a collision/sinking which results in a hydrocarbon and/or debris release, impacts to the marine environment are not expected to be long-term, given the properties of MDO in the ocean, with full recovery in time. Consideration has been given to the potential impacts on the environmental sensitivities within the OA. Of relevance to the OA, is the potential risk of impact to protected species such as marine mammals (including the PBW and SRW), threatened/vulnerable shark and pelagic fish species, marine turtles and seabirds. Following the implementation of control measures the potential risk of any impacts occurring to protected species are considered to be Low. In the unlikely event that a spill occurs, toxicity will be highest in areas close to the spill source. However, MDO is expected to rapidly evaporate and disperse/partition the offshore environment, reducing the acute toxicity of the spill. Whilst some of the potential impacts to sensitive receptors identified were substantial, including localised mortality (e.g. zooplankton), toxic effects (e.g. pelagic fish) and/or, in the case of oil beaching, disruption or damage to important habitat (e.g. seabird nesting habitat), the effects are expected to be localised and short term. Therefore, the threat to protected ecological populations was considered to be Low. Due to the low risk of potential impacts to benthic habitats and communities which contribute to the value of protected areas such as the Zeehan AMP and Nelson AMP, the West Tasmania Canyon KEF, impacts to these sensitivities are not expected. The release of hydrocarbons has the potential to impact the coastal environment and, by extension, sites of cultural heritage value through beaching. The worst-case outcome from the simulations resulted in 11% of the spilled volume beaching on the VIC western coastline, across a stretch of coastline determined to have native title. Results of the modelling indicate that rapid dispersion and evaporation of MDO will significantly reduce the volume reaching shoreline locations where this material will be broken down through natural weathering and biodegradation. Based on this assessment and the implementation of proposed control measures, the risks to the coastal marine environment and sites of cultural heritage value are considered Low. Debris released from a collision/sinking may pose a temporary and localised navigational risk to commercial shipping and tourism operations, as well as causing temporary impacts to visual amenity which preclude typical tourism activities. Additionally, impacts to the profitability of fishing activities following a hydrocarbon spill are expected to impact fishers and their associated operations initially. Following the implementation of the proposed control measures these potential impacts to shipping, tourism, recreational and commercial fishing activities if a spill occurred, the impacts are considered to be Low. The proposed control measures provide appropriate protection to the marine environment and from the risk of vessel collision/sinking and associated effects (debris and hydrocarbon release), and further/alternative control measures would give very little or no further protection from vessel collision/sinking while greatly increasing time and cost of the survey and also increase the potential conflict and displacement with the fishing industry.

Criteria for Acceptance	Acceptability Summary
Existing Environmental Context - Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of a hydrocarbon spill response has been determined to be Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. The OA overlaps with two AMP boundaries (the Zeehan AMP and Nelson AMP), and the EMBA overlaps with a further eight AMPs (the Apollo AMP, Franklin AMP, Boags AMP, Murray AMP, Huon AMP, Tasman Fracture AMP, Beagle AMP, and East Gippsland AMP). Oil pollution response, environmental monitoring and remediation activities can be undertaken with IUCN Category VI zones (multiple use zones that include all AMPs in the OA and overlapping with the EMBA) when undertaken in accordance with a NOPSEMA approved EP that has met all required environmental management arrangements for the activity covered in the class approval. However, any oil pollution incident that may affect other IUCN category zones requires prompt consultation with the Director of National Parks. Any spill occurring within, or likely to impact, any AMP should be notified to the Director of National Parks as soon as possible, by contacting the Marine Park Compliance Duty Officer (0419 293 465). Notifications must include time and location of the incident, response arrangements as per the OPEP and contact details for titleholder and response coordinators.
Social Acceptance – Relevant Persons Expectations	During consultation with relevant persons no concerns about the impacts from responding to a hydrocarbon spill were raised and as such no additional control/mitigation measures were expected or put in place. However, the DNP noted that they are to be made aware of oil/gas pollution incidences which occur within a marine park, or are likely to impact on a marine park, as soon as possible. To ensure this expectation is met, a corresponding control measure is proposed to be implemented, as outlined in **Table 128**. Concerns were raised by relevant persons around the potential for an MDO spill to detrimentally affect stocks of commercially harvested kelp, accumulate on beaches (and affect a pristine image), and have long-term and/or permanent impacts. With the strict control measures in place to ensure there are no MDO spills into the marine environment, the risk of environmental impacts relating to MDO spill from survey vessels are considered to be at a socially **Acceptable Level.** As such, the environmental impacts relating to responding to a hydrocarbon spill were considered to be at a socially **Acceptable Level**.
External Context – Commonwealth and State Legislative Criteria	The proposed control measures for vessel collision/sinking/refuelling incidents during the Otway Basin 3D MC MSS are consistent with the following relevant legislation: • The Navigation Act 2012 - requires approved navigation systems for maritime safety, navigation efficiency and management of marine pollution; • The PSPPS Act; • The Environment Regulations; and • Control measures relating to hydrocarbon spills to the ocean are consistent with MARPOL (Annex 1 Regulations for Prevention of Pollution by Oil) and Marine Order 21, 30 and 91, including having an approved and tested SOPEP for all vessels involved in the survey.
Industry Best Practice	The proposed control measures to decrease vessel collision, sinking and bunkering incidents follow industry best practice and best practice guidelines, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations which contains recommendations for SOPEPs, the mitigation of spills and leaks, and incident reporting; and • APPEA Code of Environmental Practice: offshore geophysical surveys are recommended to have environmental objectives to reduce impacts from spills and disturbance to seabed (e.g. in event of sinking), including having evidence of appropriate management procedures and emergency response plans being in place.
ALARP	Total elimination of all risks associated with potential vessel collision, sinking and bunkering incidents cannot be achieved as there are no practicable alternatives to using vessels to undertake the survey safely and effectively. Following the implementation of the control measures detailed in this assessment, the impacts/risks to the marine environment and associated receptors from vessel collision/sinking could have minor consequences. In the remote likelihood of a vessel collision, sinking and bunkering incident which results in a hydrocarbon and/or debris release, impacts to the marine environment are not expected to be long-term, given the properties of MDO in the ocean, with full recovery in time. The risks of a vessel collision occurring are reduced in a number of ways, including the adherence to legislative requirements and industry best practice, along with operating conditions (such as vessel operating at slow speeds). Therefore, the risks associated with a vessel collision and any associated hydrocarbon spill is considered to be **ALARP**. Should an unlikely vessel collision occur, which results in a hydrocarbon spill, TGS has put in place numerous measures to ensure monitoring of the situation is maintained to allow appropriate remediation. Therefore, the residual risk of a vessel collision occurring, with the associated controls in place, is considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as Type A are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined acceptable levels for that impact or risk, including those described in **Table 52**. Based on the above evaluation, the potential impacts from potential vessel collision, sinking and bunkering incidents meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of a hydrocarbon spill response on all receptors to an **Acceptable Level**.

8.3.8 Environmental Performance

Table 128 Environmental Performance Outcomes, Standards and Measurement Criteria for Vessel Collision, Sinking, Bunkering and Associated Hydrocarbon Spill

Number	Environmental Performance Outcome	Environmental Performance Standard(s)
EPO 26	No collision with other marine users	**EPS 244** - **EPS 253**, **EPS 263** - **EPS 264**, **EPS 269** - **EPS 270**, **EPS 273** - **EPS 281**
EPO 27	No release of hydrocarbons into the marine environment	**EPS 244** - **EPS 245**, **EPS 254** - **EPS 255**, **EPS 265** - **EPS 268**, **EPS 270** - **EPS 272**, **EPS 282** - **EPS 285**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 244**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 245: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
All survey vessels will adhere to the requirements of the national and international legislation, including the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of SOLAS as implemented in Commonwealth Waters through the *Navigation Act 2012* and associated Marine Orders 21, 28, 30, 58 and the STCW Convention. The requirements give effect, but are not limited to, the following: • Appropriate use of lighting, navigation and radio communication at sea; and • 24-hour bridge and radar watch by qualified watch-keepers to monitor for other marine users.	**EPS 246**: At all times the Vessel Masters comply with the requirements of national and international legislation and conventions including (but not limited to) the Navigation Act 2012 (specifically Marine Order Part 21, 27, 30, 58) COLREGS, Chapter IV (Radio communications) and Chapter V (Safety of Navigation) of SOLAS (International Convention on the Safety of Life at Sea 1974) and the STCW Convention.	Vessel Crew Training and Competency records demonstrate that all relevant marine crew are competent to STCW95/Elements of Shipboard Safety Standards. Pre-mobilisation audit and inspection are completed prior to operations and identify no records of survey vessels failing to comply with appropriate navigation and communication requirements under the Navigation Act 2012, associated Orders or conventions. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief SEA
	EPS 247: Lighting and communications equipment onboard all vessels to adhere with COLREGS, the *Navigation Act 2012* and with AMSA Marine Orders Part 30: Prevention of collisions, Part 21: Safety and emergency arrangements and Part 27 (safety of navigation and radio equipment).	Pre-mobilisation audit and inspection are completed prior to operations and identify no records of survey vessels failing to comply. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 248: The survey vessels will have the appropriate communication equipment onboard and will be contactable and also able to communicate with other vessels by radio at all times (i.e. VHF and SSB radio).	Bridge logs confirm VHF and SSB radio communications are always available.	Vessel Master Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
	EPS 249: The Seismic Vessel displays day shapes and lights (during hours of darkness/poor visibility) to indicate that the vessel is towing equipment resulting in the Seismic Vessel being restricted in its ability to manoeuvre.	Pre-mobilisation audit and inspection are completed prior to operations and confirm that the relevant equipment is onboard, tested and operational. Bridge logs verify this during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 250: The Seismic Vessel is equipped with Radar and AIS systems which will be operating and monitored at all times for both transmitting and receiving vessel positions in the surrounding vicinity.	Pre-mobilisation audit and inspection are completed prior to vessel leaving port and confirm Radar and AIS are present and operational. Bridge logs confirm Radar and AIS are used.	Vessel Master. Party Chief SEA CSR
	EPS 251: The Seismic Vessel will have ARPA onboard for the detection of other vessels. The ARPA system can track other vessels speed and heading and can monitor for the potential of any collisions so the vessels can be contacted prior to any situation occurring.	Pre-mobilisation audit and inspection are completed prior to vessel leaving port and confirm ARPA are present and operational. Bridge Logs confirm ARPA is used during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 252: Qualified crew maintain 24/7 watch-keeping during the survey in compliance with the STCW Convention. Watch keeping duties includes monitoring of vessel position (radar and plotter) and water depth at all times during seismic acquisition.	Bridge logs verify watch has been undertaken during the Otway Basin 3D MC MSS.	Vessel Master Party Chief
	EPS 253: Watch keepers are qualified in accordance with STCW95 (or equivalent).	Procurement process includes requirement for Contractor to review/provide qualifications/training of crew members. Induction records outline qualifications/training of all crew members.	VOC Vessel Master
Vessels over 400 gross registered tonnage hold an approved and tested SOPEP, with crew trained in its implementation.	**EPS 254**: SOPEP formulated, known to all staff and kept up to date onboard the vessels so that in the event of a collision where hydrocarbons are released there is a plan in place to contain or clean-up.	Pre-mobilisation audit and inspection prior will confirm vessels holds an up-to-date SOPEP. Induction records show content of induction meeting and participation of crew.	Vessel Master. Party Chief SEA CSR
	EPS 255: Prior to the commencement of the Otway Basin 3D MC MSS operations, the SOPEP will be tested including testing of communications and a vessel-based drill in hydrocarbon spill response.	Induction records and bridge logs confirm testing of SOPEP has occurred and drills have been carried out.	Vessel Master. Party Chief.
	EPS 256: The Vessel Master will authorise actions in accordance with the vessel specific SOPEP and survey specific SOPEP to avoid, and where avoidance is not possible, minimise the escape of hydrocarbons.	Incident Report from a hydrocarbon spill response will confirm whether SOPEP has been followed.	Vessel Master. Party Chief.
	EPS 257: Notification procedures will be implemented, including AMSA and regulatory agencies, including: • AMSA report notification; • NOPSEMA reports; • Regulatory agencies (including DNP); • TGS incident report; and • Pollution report (**POLREP**).	In event of vessel collision/sinking and release of MDO all appropriate forms will be completed and submitted to relevant authorities	TGS VOM Vessel Master.
In the event of a spill to the marine environment, the OPEP will be implemented.	**EPS 258**: The Vessel Master will authorise actions in accordance with the vessel specific SOPEP and the survey specific OPEP to avoid, and where avoidance is not possible, minimise the escape of hydrocarbons.	Incident Report from a hydrocarbon spill response will confirm whether OPEP has been followed	Vessel Master
	EPS 259: MDO is the primary fuel for vessels associated with the Otway Basin 3D MC MSS. No HFO powered vessels will be used.	Bunker note shows MDO utilised.	Vessel Master. Party Chief.

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Vessels will only utilise MDO. Vessel fuel to be stored in compartmentalised and/or multiple separate onboard fuel tanks.	**EPS 260**: Fuel tanks onboard the vessels will be compartmentalised or consist of multiple smaller tanks throughout the vessel.	Pre-mobilisation audit and inspection prior to beginning of survey will confirm the vessel's fuel storage system.	Vessel Master. Party Chief.
Refuelling will occur away from the Zeehan AMP and Nelson AMP.	**EPS 261**: Refuelling is not undertaken within the sensitive areas as shown in **Figure 92.**	Bridge logs show refuelling undertaken outside of sensitive areas	Vessel Master. Party Chief SEA CSR
	EPS 262: Shape files will be loaded onto the survey vessels' navigation system outlining exclusion areas within which refuelling operations cannot occur	Exclusion polygons on survey vessel's navigation system.	Vessel Master. Party Chief SEA CSR
Appropriate use of radio communication at sea.	**EPS 263**: The survey vessels will have the appropriate communication equipment onboard and will be contactable and also able to communicate with other vessels by radio at all times (i.e. VHF and SSB radio).	Bridge Logs confirm VHF and SSB radio communications are always available.	Vessel Master. Party Chief
Utilising accurate weather forecasting information for planning operations.	**EPS 264**: Survey vessels, as well as onshore project team, to receive wind, wave and current information for the OA four times daily from subscription service.	Copies of the forecasts will be included with the daily reports/logs and kept on file.	Vessel Master EA TGS VOM
Contract in place with appropriate service provider to initiate real-time modelling in case of a spill.	**EPS 265**: Prior to the commencement of the Otway Basin 3D MC MSS, TGS will secure services (signed contract) with a third party for provision of real-time modelling of a hydrocarbon spill if and when required	Service contract in place prior to commencement of the survey.	TGS VOM.
In case of a spill <10m^3, TGS will implement relevant Type I Operational Monitoring.	**EPS 266**: If health and safety requirements permit, the Support Vessel assisting the Seismic Vessel will be used in the monitoring of any hydrocarbon spill.	Incident report provides details on operational monitoring undertaken.	Vessel Master. Party Chief VOC TGS VOM
Type II Scientific Monitoring undertaken (informed by updated NEBA/SIMA) in case of spill if real-time modelling shows the spill will impact land, in consultation with the CA.	**EPS 267**: Prior to the commencement of the Otway Basin 3D MC MSS, TGS will secure services (signed contract) with a third party for standby services in order to undertake Type II scientific monitoring as specific within the OPEP, should a hydrocarbon spill reach the shoreline,	Service contract in place prior to commencement of the survey.	TGS VOM
Hydrocarbon spill response training and competencies will be maintained throughout the Otway Basin 3D MC MSS to avoid unplanned environmental impacts due to human error.	**EPS 268**: Prior to the commencement of the Otway Basin 3D MC MSS an audit will be conducted to ensure all staff are trained and inducted satisfactorily to ensure they are competent in responding to a hydrocarbon spill.	Pre-mobilisation audit results confirm inductions have been completed. Induction and daily records confirm training and induction has been carried out and crew present.	Vessel Master. EA SEA CSR
AIS transponders fitted to survey vessels and tail buoys.	**EPS 269**: Vessels and associated survey equipment (e.g. tail buoys) will have correctly fitted and functioning AIS transponders.	Pre-mobilisation audit and inspection prior to beginning of survey confirms correct operation of all AIS transponders for both transmitting and receiving.	Vessel Master. Party Chief SEA CSR
All crew will participate in the vessel and environmental induction prior to the commencement of operations.	**EPS 270**: All crew will participate in a vessel and environmental induction prior to the commencement of the survey, or on each crew change.	Induction records show content of induction meeting and participation.	Vessel Master. Party Chief. EA
Spill response equipment will be available and maintained onboard each vessel and located in close proximity to hydrocarbon areas and crew onboard will be trained in how to respond to any incident utilising the response equipment available.	**EPS 271**: Spill response equipment will be available and maintained/re-stocked onboard each vessel and located in close proximity to hydrocarbon areas. Crew will be trained in using response equipment.	Inspection records confirm equipment is fit-for-purpose and records any re-stocking of supplies as required.	Vessel Master. Party Chief

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Undertake hydrocarbon spill modelling prior to EP submission.	**EPS 272**: Hydrocarbon spill modelling will be used to guide the risk assessment of the EP.	Spill modelling incorporated into EP.	TGS VOM
A communications protocol will be in place between the survey vessels and other relevant persons (e.g. commercial fishers known to utilise the OA, oil and gas operators), to actively manage concurrent activities.	**EPS 273**: Pre-survey consultation with relevant persons, confirming the Otway Basin 3D MC MSS will proceed, no less than four weeks before operations commence.	Documentation of consultation and consultation log demonstrate compliance.	TGS VOM EA
	EPS 274: Onshore personnel (EA) will communicate any updates determined through the continuing consultation process to the Vessel Master, where they have the potential to impact the Otway Basin 3D MC MSS and/or relevant persons.	Documentation of consultation and consultation log demonstrate compliance. Forms part of continuing consultation strategy.	EA Vessel Master
	EPS 275: Relevant persons will be notified following the conclusion of the survey as per the following Post-Activity Notifications: • All relevant persons – relevant time post completion; • AMSA – relevant time post completion; • NOPSEMA – 10 days post completion advising the completion of the Seismic Survey; and • NOPSEMA – As soon as practicable advising that all of the activities and obligations covered under the EP have been completed.	Documentation of consultation and consultation log demonstrate compliance.	TGS VOM EA
	EPS 276: A 48-hour 'look-ahead plan' will be provided to relevant persons (who register for the service) identified throughout the relevant persons consultation process, detailing the survey activities over the next 48 hours. The 48-hour look-ahead plans will be updated and issued every 24 hours and distributed to relevant persons via email.	Documentation of consultation, consultation log and issuing of weekly and 48-hour look-ahead plans demonstrate compliance. Forms part of continuing consultation strategy.	TGS VOM EA CSR Vessel Master
Notification to the AHO for the publication of a Notice to Mariners of survey presence and towed array, no less than four weeks before operations commence.	**EPS 277**: A Notice to Mariners will be published and distributed by the AHO under the Navigation Act 2012, informing other marine users of the Otway Basin 3D MC MSS, no less than four weeks before operations commence.	Record of Notice to Mariners.	TGS VOM EA
	EPS 278: Should any changes occur the survey acquisition plan throughout the duration of the Otway Basin 3D MC MSS, all Notice to Mariners will be updated as soon as reasonably practicable.	An updated Notice to Mariners will be issued.	TGS VOM EA CSR Vessel Master
Notification to the JRCC for the promulgation of navigational warnings (i.e AUSCOAST warnings)	**EPS 279**: The JRCC will be contacted 24 – 48 hours prior to the commencement of survey operations for issuing of radio navigation warnings.	Record of notification to JRCC.	TGS VOM EA
Notification to the DNP in the event of an oil spill.	**EPS 280:** The DNP will be verbally notified in the event of an oil spill from any vessel associated with the Otway Basin 3D MC MSS as soon as possible. This will be fulfilled through notification to the Marine Park Compliance Duty Officer (0419 293 465) and notification will include titleholder details, time and location of the incident, proposed response arrangements and locations as per the OPEP, and contact details for the response.	Record of notification to DNP through the Marnie Park Compliance Duty Officer.	TGS VOM EA
At least one Support Vessel will accompany the Seismic Vessel when in operation and when safe to do so (e.g., outside of inclement weather periods), to manage interactions with other marine users.	**EPS 281**: The support vessels will manage vessel interactions through travelling between and maintaining communications with any third-party vessels in the OA..	Bridge logs verify support vessels have successfully communicated with all third-party vessels encountered in the OA.	Vessel Master

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Seismic survey vessel contractor procedures include requirements to be implemented during refuelling operations, including: • A completed Permit to Work; • A JSA implemented for bunkering operations; • Visual monitoring of gauges, hoses, fittings; • Sea surface bunkering; • Hose checks prior to commencement; • All crew are spill response trained; and • Spill response equipment is nearby, easily accessed and fully stocked.	**EPS 282**: Each vessel will carry out refuelling and bunkering in accordance with a vessel-specific refuelling and bunkering procedure which includes the following minimum requirements: • A completed Permit to Work; • A JSA implemented for bunkering operations; • Visual monitoring of gauges, hoses, fittings prior to any refuelling or bunkering activity; • Sea surface bunkering; • Hose checks prior to commencement; • All crew are spill response trained; and • Spill response equipment is nearby, easily accessed and fully stocked.	Pre-mobilisation audit confirms refuelling and bunking procedures are in place. Audits/inspection records confirm refuelling and bunkering is being performed in compliance with the vessel-specific refuelling and bunkering procedures.	Vessel Master. Party Chief SEA CSR
	EPS 283: Vessel crew are to maintain constant surveillance and communication while refuelling.	Bunker note provides details on PTW, JSA and bunkering procedures undertaken.	Vessel Crew
Dry-break couplings will be installed on refuelling hoses.	**EPS 284:** Dry-break couplings will be installed on refuelling hoses	Pre-mobilisation audit and inspection prior to beginning of survey will confirm.	Vessel Master Party Chief
At sea refuelling operations will only take place during daylight hours and within strict weather limit guidelines.	**EPS 285:** Refuelling operations will only take place during daylight hours and within strict weather limit guidelines	Bunker note provides details on time of day and weather during refuelling operations.	Vessel Master.

8.3.9 Vessel Collision, Sinking, and Bunkering and Associated Hydrocarbon Spill Impact and Risk Summary

Based on the discussions above, including the potential impacts on the environment and the associated controls measures to be implemented, the residual risk of vessel collision/sinking/bunkering incidents and associated hydrocarbon spill is considered to be **Low**.

The risks of a vessel collision occurring are reduced in a number of ways, including the adherence to legislative requirements and industry best practice, along with operating conditions (such as vessel operating at slow speeds). Consequently, it is considered that the environmental impacts and risks on the marine environment and receptors arising from a vessel collision/sinking/bunkering incident and associated hydrocarbon spill are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4**, the suite of control measures are considered appropriate to manage the risks and impacts arising from a vessel collision/sinking/bunkering incident and associated hydrocarbon spill during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

8.4 Hydrocarbon Spill Response

8.4.1 Description of Source of the Impact and Risk

In the unlikely event that a hydrocarbon spill occurs within the marine environment from a vessel associated with the Otway Basin 3D MC MSS, several spill response options can be initiated for a clean-up response.

Table 129 provides an overview of the response options available with an assessment on the advantages and disadvantages of each option, and their appropriateness for use if a spill occurred during the Otway Basin 3D MC MSS.

Table 129 Assessment of Spill Response Options

Response Option	Advantages of use	Disadvantages of use	Appropriateness of use
Source control (securing cargo / trimming).	Reduction in volume of MDO entering the marine environment.	No disadvantages identified.	This response option is suitable to both Level 1 and Level 2 responses and will be adopted in accordance with the SOPEP onboard the vessels. In the event of a fuel tank rupture, or hydrocarbon storage spill occurring, cargo of the affected tank/storage containers is to be secured by any available means, including transfer to another storage area, another vessel or through pumping in water to create a water cushion. Trimming the vessel may also be used to avoid further damage to intact tanks. These actions will minimise the volume of MDO spilled.
Natural weathering (monitor and evaluate – vessel/aerial surveillance and trajectory modelling).	Provides valuable information for situational awareness to inform response options. Surveillance results can also be used to assist in escalating or de-escalating response strategies as required.	Does not directly reduce potential impacts from the spill. Potential increase in the vessel/aviation activity in the area resulting in increased disturbance to fauna, including increased risk of collisions.	Vessel surveillance will be done for level 1 and level 2 spills using available vessels on scene, such as the Support Vessel, for opportunistic surveillance operations. However, priority for human health and safety will take place should a significant vessel casualty occur. TGS will have a contract in place with an appropriate service provider to initiate real-time modelling in the case of a spill. These modelling outputs can be used to guide appropriate response options. Monitoring requirements and approach will be assessed by the relevant Controlling Authority.
Physical break-up (vessel prop-washing).	Enhances natural degradation processes through the water column.	Increased vessel activity – additional noise, light, and atmospheric emissions. Increased health and safety risks from the presence of additional vessels.	This response option may be utilised during the Otway Basin 3D MC MSS.

Response Option	Advantages of use	Disadvantages of use	Appropriateness of use
		Potential for reduced evaporation of MDO by entraining it into the water column.	Vessel prop washing promotes entrainment within the water column and reduces potential evaporation, potentially keeping the substance in the water for longer periods. However, this option would only be undertaken if requested by the Controlling Authority, which their decision-making process would be dependent on the spill location and a NEBA.
Application of dispersants.	No advantages identified for MDO as it is not a persistent hydrocarbon. MDO has a high natural dispersion rate in the marine environment.	Additional release of chemicals into the marine environment that may have toxic effects on marine fauna.	This response option is not recommended for the Otway Basin 3D MC MSS as it is not beneficial for reducing the net environmental impact of a MDO spill. It has a low probability of increasing the dispersal rate of the spill whilst introducing more chemicals into the marine environment.
Contain and recover (booms and skimming).	MDO potentially removed from the environment. Reduces chances for fauna to become oiled.	Use is restricted by surrounding weather conditions – i.e. in rough weather conditions, booms and skimmers will not work. Increased vessel activity – additional noise, light, and atmospheric emissions. Very labour intensive with an increased volume of waste generated.	This response option is not recommended for the Otway Basin 3D MC MSS as the fast-spreading rates of MDO and the low viscosity will cause the slick to break-up and disperse quickly resulting in a reduced ability to contain and recover the MDO from the ocean.
Protect and deflect (booms etc.).	MDO potentially removed from the environment. Reduces chances for shoreline fauna to become oiled.	Increased activity – additional noise, light, and atmospheric emissions. Very labour intensive with an increased volume of waste generated. Potential additional damage to intertidal and benthic habitats from equipment.	This option is not recommended for the Otway Basin 3D MC MSS as MDO is not expected to be persistent and corralling of MDO is generally not effective. Tidal flushing and bioremediation are expected to be sufficient in the worst-case scenarios to prevent any significant environmental impact.
Shoreline clean-up (physical removal, surf washing, flushing, natural dispersion).	MDO potentially removed from the environment. Reduces chances for shoreline fauna to become oiled.	Increased activity – additional noise, light, and atmospheric emissions. Very labour intensive with an increased volume of waste generated. Potential damage to sensitive shoreline species. Weather dependant.	This option is not recommended as it is an intrusive response that requires careful site-specific planning in order to reduce secondary impacts of beach erosion and spreading oil beyond shorelines.

Response Option	Advantages of use	Disadvantages of use	Appropriateness of use
			This response has the potential to cause more harm due to secondary disturbance compared to the initial potential light oiling. Therefore, if light shoreline contact occurs, TGS considers that any onshore response options would best occur under the National Plan.
Oiled Wildlife Response (capture and rehabilitation).	Aids recovery of oiled wildlife.	Increased activity – additional noise, light, and atmospheric emissions. Approaching marine fauna could flee and dive into spilled MDO as a result of activity. Pre-emptive capture may result in reduced survival.	Undertaking this response option has the potential to result in more harm if poorly executed. Activities such as hazing (dispersing) of birds will not be undertaken given the low likelihood of a spill of a size presenting a significant risk of oiling wildlife unless at the direction of, and under direct supervision of trained personal from the Controlling Authority. Capture and rehabilitation may be undertaken under the National Plan.

The activities associated with a response to a hydrocarbon spill introduce further risks to marine fauna and flora, including:

- Increased disturbance of avifauna (both shore and sea birds) and marine mammals;
- Increased risk of vessel strikes with an increased number of vessels in the area conducting the response;
- Potential inclusion of additional chemical agents into the marine environment (i.e. dispersants);
- Potential physical damage to habitats from deployment of booms in the intertidal zone; and
- Potential damage to intertidal habitats from trampling (via foot or vehicles), removal of oiled sediment, chemical control agents and dispersants.

8.4.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 130**.

Table 130 Environmental Receptors Assessed

Receptor	Section reference
Seabirds and shorebirds	**Section 8.4.2**
Marine mammals	
Relevant persons (marine shipping, commercial fisheries, recreational users)	
Benthic habitats (intertidal and shoreline)	
Seabirds and shorebirds	

Undertaking clean-up activities have the potential to disturb the physical environment and marine/coastal habitats and fauna through the use and operation of vehicles, personnel and other necessary equipment. These disturbances can also cause impacts to cultural and amenity values.

Each of the potential response options has been assessed within **Table 129** which includes the potential disadvantages associated with each option, including those potential impacts on the environment, including:

- Increase in the vessel/aviation activity in the area, resulting in increased disturbance to fauna, including additional risks of collisions;
- Additional noise, light and atmospheric emissions causing disturbances to fauna and other users of the marine environment (tourism and recreation, cultural heritage etc.);
- Increased health and safety risks from the presence of additional vessels; and
- Potential damage to sensitive shoreline species from shoreline clean-up.

To reduce the potential impacts from response options, the potential response actions will be based on a NEBA approach which considers the advantages and disadvantages of the different spill response options to determine if there would be a net environmental benefit resulting from the implementation of a particular response.

NEBA and SIMA are commonly used globally for evaluating the potential benefits versus impacts of implementing a pre-defined spill response strategy. The purpose is to identify the most appropriate response strategy(ies) which can be implemented under real-time factors influencing the spill dynamics (location, amount, prevailing weather conditions etc). It can also be a rapid decision-making tool employed by the Controlling Authority under time constraints.

The following is a summary of steps normally used by the Controlling Authority to conduct a NEBA/SIMA for a Level 2 (summarised from IPIECA (2016)):

- Compile and evaluate data for relevant spill scenarios (oil properties, situational awareness, oil spill trajectory modelling, environmental sensitivities, identification of resources at risk, and determination of feasible response options);
- Predict outcomes/impacts for the no intervention for the 'no intervention' (or 'natural attenuation' / unmitigated spill impact) option as well as the effectiveness (i.e. relative mitigation potential) of the feasible response options for each scenario;
- Balance trade-offs by weighing and comparing the range of benefits and drawbacks associated with each feasible response option, including no intervention, for each scenario; and
- Select the best response option/s to form the strategy for each scenario, based on the combination of techniques that will minimize the overall ecological, socio-economic and cultural impacts and promote rapid recovery, and maximise potential for environmental protection

NEBA takes into account the hydrocarbon type, the sensitivities within the wider area of the spill, and the potential impacts, both positive and negative, of the proposed response strategy. This analysis is used for the preliminary assessment to determine the level of spill response required, and to assist in the prioritisation of response actions. During a spill event, the NEBA will be revisited regularly by the Controlling Authority (and subject matter experts as required) as more information becomes available on weather conditions relevant to at spill location, the spill trajectory and locations of sensitive receptors in the surrounding areas.

Initial response to an oil spill incident will be undertaken by the relevant Vessel Master. For vessel oil spill incidents, the Vessel Master will act in accordance with the relevant SOPEP where applicable. Oil spills from vessels are categorised in two levels:

- **Level 1 Vessel Spill** - Initial activations for a Level 1 spill are based on a spill incident that is small in scale/volume (up to 10 m^3), will not have an adverse effect on the public or the environment and can be controlled by the use of resources typically available aboard the vessel without the need to mobilise an Incident Management Team or other external assistance. Spills that require this level of response may arise from blown hydraulic hoses, dropped or leaking drums of fuel or lubricant or minor refuelling accidents; and

- **Level 2 Vessel Spill** - Level 2 spills are those that require external assistance and resources to mitigate impacts from a larger spill (up to 1,000 m^3) and will involve response activation through additional support teams. The worst-case vessel spill scenarios during the activities fall into this category which include a vessel refuelling incident and a fuel tank rupture incident.

The residual risk to environmental receptors from the response methods utilised to clean up a hydrocarbon spill have been assessed as **Low** (*Minor* x *Remote*).

8.4.3 Decision Context

The decision context for the hydrocarbon spill response has been assessed as Type A given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

8.4.4 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

Control measures that have been considered for the Seismic Survey to manage the potential risk/impacts associated with hydrocarbon spill response options to ALARP are listed in **Table 132**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction based on a Hierarchy of Controls methodology (**Table 131**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 131 Hierarch of Control Measures for Hydrocarbon Spill Response

Eliminate	A significant response to a hydrocarbon spill is required; however, those methods that increase the risks to the environment have been eliminated (such as releasing a chemical dispersant) as the benefit of using these methods does not outweigh the risks associated with their use.
Substitute	There are no suitable substitutes for the response to a hydrocarbon spill event. The most applicable response has already been determined, using the NEBA approach (**Table 132**).
Reduce	The methods will also be analysed in consultation with the Controlling Authority through a NEBA process to ensure the most appropriate method is used in responding to a spill event. Any reduction in the impacts of a response to a hydrocarbon spill will be weighed against the net environmental benefit achieved.
Mitigate	Control measures have been assessed within **Table 132** to mitigate impacts associated with the nominated response/s to a hydrocarbon spill to **ALARP** and **Acceptable Levels**. Those measures which are appropriate and are not impractical or unfeasible will be implemented during the Otway Basin 3D MC MS.

Table 132 Assessment of Control Measures for Hydrocarbon Spill Response

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements:			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of routine permissible waste discharges.	Yes
Vessels >400 GRT (MARPOL 73/78 Annex I) hold an approved and tested SOPEP and crew are trained in its implementation. The SOPEP will be implemented for first strike response to level 1 and level 2 spills.	P = Yes E = Effective	In accordance with the requirements of Annex I of MARPOL 73/78, vessels will have a SOPEP. By ensuring a SOPEP is in place for the vessel, the likelihood of a spill entering the marine environment is reduced. TGS will implement the response strategy in accordance with the SOPEP, and also in line with relevant legislation and industry standards.	Yes
Good Industry Practice:			
Operational monitoring will be undertaken in order to inform and update the Controlling Authority about the behaviour of the spill.	P = Yes E = Effective	Operational Monitoring (such as using the Support Vessel to monitor the spill) will be undertaken in the unlikely event of a hydrocarbon spill to provide up-to-date information on the fate of any hydrocarbon spill in the water. This monitoring will allow appropriate response options to be established with the Controlling Authority and undertake appropriate NEBA analysis to reduce the potential impacts from responding to a hydrocarbon spill. Good industry practice, environmental benefit outweighs additional cost.	Yes
Contract in place with appropriate service provider to initiate real-time modelling in case of a spill.	P = Yes E = Effective	Undertaking real-time modelling will provide assurances that response options can be tailored to the specific spill situation. The modelling will be used to predict the potential beaching locations (if any exist) and inform the responders in order to assist in reducing the potential impacts from the response options if possible. Good industry practice, environmental benefit outweighs additional cost.	Yes
Hydrocarbon spill response training and competencies will be maintained throughout the Otway Basin 3D MC MSS to avoid unplanned environmental impacts due to human error.	P = Yes E = Effective	Ensuring all crew have appropriate training is vital in responding to a hydrocarbon spill and ensuring that impacts to the environment are not exacerbated through the response options themselves. Drills will also be undertaken to ensure all crew are competent in responding to spills under the vessel specific SOPEP. These drills will be conducted at regular intervals to ensure competencies are maintained for the duration of the Otway Basin 3D MC MSS. Good industry practice, environmental benefit outweighs additional cost.	Yes
A hydrocarbon spill will be immediately reported from the TGS onboard representative to TGS in Perth to ensure all notifications are provided as per **Section 10.10.6.3.**	P = Yes E = Effective	Notifications will ensure quick and appropriate response to a spill scenario and will be in accordance with SOPEP and in accordance with relevant legislation and industry standards, ultimately informing the response options and allowing a NEBA to be undertaken. Good industry practice, environmental benefit outweighs additional cost.	Yes
Fishing industry and other relevant persons will be notified in the event of a spill. Notification to the DNP in the event of an oil spill.	P = Yes E = Effective	Communication with relevant persons allows those potentially affected by a hydrocarbon spill to plan activities in a manner that reduces the risk of interactions. The DNP should be made aware of unplanned events such as an oil spill which occurs within an AMP, or is likely to affect any AMPs, as soon as possible. Parks Australia plays a role in the National Plan for Maritime Environmental Emergencies. The DNP should be notified through notification to the Marine Park Compliance Duty Officer (0419 293 465). Notification should include: titleholder details, time and location of the incident, proposed response arrangements and locations as per the OPEP, and contact details for the response. Good industry practice, environmental benefit outweighs additional cost.	Yes
NEBA to be conducted prior to response actions.	P = Yes E = Effective	Response actions will be based on a NEBA approach which considers the advantages and disadvantages of the different spill response options to determine if there would be a net environmental benefit resulting from the implementation of a particular response. Good industry practice, environmental benefit outweighs additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternatives/Substitutes Controls Considered:			
Eliminate vessels to avoid spill, and hence avoid impacts from response options.	P = No E = Very Effective	There are no practicable methods for undertaking the Otway Basin 3D MC MSS without the use of specialist survey vessels. Costs would be disproportionate to the benefit that may be gained.	No
Additional Control Measures Considered:			
Dedicated spill response vessel and resources on standby.	P = No E = Effective	The option of having a dedicated spill response vessel on standby for the survey was discounted on the basis that the cost would be grossly disproportionate to any reduction in risk (which is already determined to be Low), particularly as the expected behaviour of an MDO spill would limit the effectiveness of on-water response options. Additional vessels could also increase the risk of interference and potential for collisions.	No
Pre-activity monitoring program and development of detailed Type II Monitoring Plan.	P = No E = Fairly Effective	TGS do not consider it practicable to undertaken monitoring or development of a detailed Type II monitoring program in response to the unlikely risk of a hydrocarbon spill. The characteristics of MDO will likely result in rapid dispersion. In addition, TGS will implement various controls that will reduce the risks of vessel collision; implementation of SOPEP to prevent loss of an entire tank contents. Costs would be disproportionate to the benefit that may be gained.	No
Additional response equipment on board the Support Vessel.	P = No E = No	It is not reasonable for additional resources to be provided and maintained on the Support Vessel in the unlikely event of a spill. The Support Vessel is already equipped to best practice levels and supported by the National Plan. In order to carry the additional equipment (such as booms), additional vessels would be required. Costs would be disproportionate to the benefit that may be gained.	No
Arrangements for aerial monitoring.	P = No E = No	It is not considered that these resources could be mobilised faster than what can already be achieved under the National Plan arrangement. Costs would be disproportionate to the benefit that may be gained.	No
Residual Risk of Impact (Receptor)	**Consequence**	**Likelihood**	**Risk Ranking**
Seabirds and shorebirds	Minor	Remote	Low
Marine mammals	Minor	Remote	Low
Relevant persons (marine shipping, commercial fisheries, recreational users)	Minor	Remote	Low
Benthic habitats (intertidal and shoreline)	Minor	Remote	Low
ALARP Statement			
The decision context has been assessed as Type A and the overall residual risk has been determined to be **Low**. TGS considers the adopted control measures are sufficient to minimise the risk of impacts from a hydrocarbon spill response are appropriate to the localised nature and small scale of the predicted environmental impacts associated with a spill response. The proposed control measures have been developed in accordance with Good Industry Practice, taking into account the specific environmental, social, economic and cultural characteristics of the OA and predicted impacts to other marine users. Additional control measures have been considered as part of the assessment process; however, it was considered that they did not provide any further environmental benefit or were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from a hydrocarbon spill response are reduced to **ALARP**.			

8.4.5 Impact and Risk Acceptability

Table 133 Demonstration of General Impact and Risk Acceptability for Hydrocarbon Spill Response

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to be Low.
Ecologically Sustainable Development	The management of the risk proposed by TGS associated with the response to a hydrocarbon spill can be carried out in compliance with the five principles of ESD as defined within the EPBC Act. These principles have been considered as part of the development of the EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS Internal Context	The proposed management of the risks of streamer loss and its associated impacts will be informed by TGS's Non-Routine Equipment Recovery Procedures and Environmental and QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	Following implementation of control measures the potential risk of any impacts occurring to water quality, and marine flora and fauna in the surrounding marine environment from the response to a hydrocarbon spill is unlikely. It is also highly unlikely to pose a risk to the management objectives for protected or sensitive areas (i.e. AMPs, KEFs etc.), habitats (i.e. subtidal), fauna and flora present. No impacts are predicted on the existing environment within or surrounding the OA from a response to a hydrocarbon spill. Due to the open ocean nature of the OA, in the unlikely event that a spill occurs, the MDO would undergo rapid and significant dilution as soon as it entered the receiving environment, and concentrations would quickly dilute and disperse. The resulting response to a spill of this nature would be to primarily monitor and observe the spill, with the resulting impacts of such a response principally being from additional vessels within the OA. The proposed control measures provide appropriate protection to the marine environment from the response to a hydrocarbon spill, and from a detailed assessment process it is considered that any further/alternative control measures would give very little or no further protection from the response to a hydrocarbon spill.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of a hydrocarbon spill response has been determined to be Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. The OA overlaps with two AMP boundaries (the Zeehan AMP and Nelson AMP), and the EMBA overlaps with a further eight AMPs (the Apollo AMP, Franklin AMP, Boags AMP, Murray AMP, Huon AMP, Tasman Fracture AMP, Beagle AMP, East Gippsland AMPs). Oil pollution response, environmental monitoring and remediation activities can be undertaken with IUCN Category VI zones (multiple use zones that include all AMPs in the OA and overlapping with the EMBA), when undertaken in accordance with a NOPSEMA approved EP that has met all required environmental management arrangements for the activity covered in the class approval. However, any oil pollution incident that may affect other IUCN category zones requires prompt consultation with the Director of National Parks.
Social Acceptance – Relevant Persons Expectations	Although concerns were raised during consultation with relevant persons around the potential effects of an oil spill (see **Section 8.3**), no concerns about the impacts from responding to a hydrocarbon spill were raised and as such no additional control/mitigation measures were expected or put in place. However, the Director of National Parks noted that they are to be made aware of oil/gas pollution incidences which occur within a marine park, or are likely to impact on a marine park, as soon as possible. To ensure this expectation is met, a corresponding control measure is proposed to be implemented, as outlined in **Table 134.** As such, the environmental impacts relating to responding to a hydrocarbon spill were considered to be at a socially **Acceptable Level**.
External Context – Commonwealth and State Legislative Criteria	The proposed control measures for responding to a hydrocarbon spill during the Seismic Survey are consistent with the following relevant legislation: • Australian Maritime Safety Authority Act 1990; • International Convention on Oil Pollution Preparedness, Response and Cooperation 1990; • United Nations Convention on the Law of the Sea 1982; • International Convention for the Prevention of Pollution from Ships 1973; • Protection of the Sea (Civil Liability for Bunker Fuel Pollution Damage) Act 2008; • EPBC Act; • EPBC Regulations; and • Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and its associated Marine Order 91 (Marine Pollution Prevention – Oil).
Industry Best Practice	The NEBA controls are in line with industry best practice with the depth of controls provided considered to reflect best practice and reasonable for the nature and scale of the activity. The APPEA Code of Environment Practice objectives with respect to reducing the impact from events such as spills to a level which is **ALARP** and acceptable are met by demonstrating the adoption of appropriate management procedures for the activity and having an appropriate emergency response plan. The IAGC Environmental Manual for Worldwide Geophysical Operations sets objectives in relation to hazardous materials for spill leak response which is met by the Otway Basin 3D MC MSS.
ALARP	Complete elimination is not possible as the response is required in the event of a hydrocarbon spill.

Criteria for Acceptance	Acceptability Summary
	Based on the assessment above, including consideration of the potential impacts on the environment and the associated controls measures to be implemented, the residual risk to the marine environment and associated receptors from the response to a hydrocarbon spill is considered to be **Low** and to **ALARP**. Therefore, the potential risk of impacts occurring from the response to a hydrocarbon spill during the Seismic Survey is considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as Type A are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined acceptable levels for that impact or risk, including those described in **Table 52**. Based on the above evaluation, the potential impacts from a hydrocarbon spill response meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of a hydrocarbon spill response on all receptors to an **Acceptable Level**.

8.4.6 Environmental Performance

Table 134 Environmental Performance Outcomes, Standards and Measurement Criteria for Hydrocarbon Spill Response

Number	Environmental Performance Outcome		Environmental Performance Standard(s)
EPO 28	No secondary impacts to the marine environment associated with a response to a hydrocarbon spill and all responses will be undertaken in accordance with the vessel SOPEP		**EPS 286** to **EPS 297**
Control Measure	**Environmental Performance Standard**	**Measurement Criteria**	**Responsible Party**
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 286**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 287: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
Vessels >400 GRT (MARPOL 73/78 Annex I) hold an approved and tested SOPEP and crew are trained in its implementation. The SOPEP will be implemented for first strike response to level 1 and level 2 spills.	**EPS 288**: The Vessel Master will authorise actions in accordance with the vessel specific SOPEP and survey specific SOPEP to avoid, and where avoidance is not possible, minimise the escape of hydrocarbons.	Incident Report from a hydrocarbon spill response will confirm whether SOPEP has been followed.	Vessel Master. Party Chief.
Operational Monitoring will be undertaken in order to inform and update the Controlling Authority about the behaviour of the spill.	**EPS 289**: Support Vessel that is associated with the Otway Basin 3D MC MSS will be available as a vessel of opportunity to monitor the spill if safe to do so and where NEBA identifies a net benefit to do so, as agreed with the Controlling Authority.	Incident Report from a hydrocarbon spill response will confirm results of spill monitoring. NEBA Report will outline the results of the monitoring	TGS VOM VOC Vessel Master
Contract in place with appropriate service provider to initiate real-time spill modelling in case of a spill.	**EPS 290**: Prior to the commencement of the Otway Basin 3D MC MSS, TGS will secure services (in the form of a signed contract) with a third party for provision of real-time modelling (dispersion and trajectory) if and when required.	Service contract in place prior to commencement of the Otway Basin 3D MC MSS and provided in pre-mobilisation audit.	TGS VOM
Hydrocarbon spill response training and competencies maintained throughout the Otway Basin 3D MC MSS to avoid unplanned environmental impacts due to human error.	**EPS 291**: Prior to the commencement of the Otway Basin 3D MC MSS an audit is conducted with all maritime crew to ensure all staff are trained and inducted satisfactorily to ensure they are competent in responding to a hydrocarbon spill. This will occur for all new staff joining the vessel during crew changes to ensure full coverage	Pre-mobilisation audit results detail hydrocarbon spill response training and competencies of staff prior to undertaking the Otway Basin 3D MS MSS. Induction and daily records confirm training and induction has been carried out and crew present.	TGS VOM Vessel Master. Party Chief SEA

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
A hydrocarbon spill will be immediately reported from the TGS onboard representative to TGS in Perth to ensure all notifications are provided as per **Section 10.10.6.3.**	**EPS 292**: Initial SOPEP report requirements will be undertaken and TGS will be immediately notified.	Phone/email records show notification undertaken. Consultation records show notification undertaken.	TGS VOM Vessel Master
	EPS 293: External notifications in the event of a level 1 or level 2 spill will be carried out as per the following reporting schedule: • TGS Project Manager – immediately; • NOPSEMA – verbal notification within two hours; • NOPSEMA – written NOPSEMA Incident Report Form no later than three days after notification; • National Offshore Petroleum Titles Administration – verbal or written incident summary within one day; • Commonwealth Department Climate Change, Energy the Environment, and Water (DCCEEW), Written POLREP notification submitted within 7 days; and • Director of National Parks – as soon as practicable following incident.	Phone/email records show notification undertaken. Consultation records show notification undertaken.	TGS VOM. Vessel Master.
	EPS 294: External notifications in the event of a Level 2 spill will be carried out as per the following reporting schedule: • AMSA – verbal notification as soon as possible, with follow-up written POLREP as soon as practicable; • Transport Safety Victoria – Maritime Safety Victoria unit: (if spill affects VIC state waters) – verbal notification as soon as it is identified that hydrocarbon may enter VIC state waters, with follow-up written POLREP as soon as practicable; • Tasmania Environment Protection Authority (if spill affects TAS waters) verbal notification as soon as it is identified that hydrocarbon may enter TAS state waters, with follow-up written POLREP as soon as practicable; • SA Department of Planning, Transport and Infrastructure (if spill affects SA waters) – verbal notification as soon as it is identified that hydrocarbon may enter SA state waters, with follow-up written POLREP as soon as practicable; • NSW Department of Transport (Maritime) (if spill affects NSW waters) – verbal notification as soon as it is identified that hydrocarbon may enter NSW state waters, with follow-up written POLREP as soon as practicable; • Type II Monitoring Service Provider – verbal notification within two hours with follow-up formal notification if and when a scientific monitoring program initiation criterion is met.	Phone/email records show notification undertaken. Consultation records show notification undertaken.	TGS VOM
Fishing industry and other relevant persons will be notified. Notification to the DNP in the event of an oil spill.	**EPS 295**: Notification with the fishing industry and other relevant persons will be undertaken utilising the same contacts associated with the 48-hour 'look-ahead' plan.	Documentation of consultation. Forms part of continuing consultation strategy.	TGS VOM
	EPS 296: The DNP will be verbally notified in the event of an oil spill from any vessel associated with the Otway Basin 3D MC MSS as soon as possible. This will be fulfilled through notification to the Marine Park Compliance Duty Officer (0419 293 465) and notification will include titleholder details, time and location of the incident, proposed response arrangements and locations as per the OPEP, and contact details for the response.	Record of notification to DNP through the Marnie Park Compliance Duty Officer.	TGS VOM EA
NEBA to be conducted prior to response actions.	**EPS 297**: Response actions will be based on a NEBA approach in consultation with CA.	NEBA Report will show the methodology and results of the NEBA.	TGS VOM

8.4.7 Hydrocarbon Spill Response Impact and Risk Summary

Based on the discussions above, including the potential impacts on the environment and the associated controls measures to be implemented, the residual risk from the response to a hydrocarbon spill is considered to be **Low.**

The suite of control measures to be implemented have been developed in accordance with Industry Best Practice and relevant legislation. Consequently, it is considered that the environmental impacts and risk on the marine environment and receptors arising from a hydrocarbon spill response are reduced to **ALARP**.

In accordance with the acceptability requirements prescribed in **Section 6.4**, the suite of control measures are considered appropriate to manage the risks and impacts arising from a hydrocarbon spill response during the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

8.5 Accidental Release of Hazardous and Non-Hazardous Materials

8.5.1 Description of Source of the Impact and Risk

The survey vessels utilised during the Otway Basin 3D MC MSS will use, store, and/or carry a range of chemicals onboard as part of standard day to day operations. These include paints, hydraulic fluid, cleaning products and other substances. Day-to-day activities will also result in the generation of a range of wastes both solid and liquid, including sewage, bottles, cardboard, paper, cans, domestic garbage and other liquid wastes. Wastes not able to be macerated or incinerated will be stored onboard the vessels for onshore disposal at suitable facilities.

Solid wastes will not be discharged to sea but rather will be stored on board the vessels prior to transfer to a support vessel for onshore recycling or disposal. Where practical, solid waste will be minimised and non-hazardous waste will be either re-used or recycled. Solid waste will be segregated onboard the vessel in specific bins in accordance with the vessel's Waste Management Plan. Bins will be fitted with lids/cargo nets for any waste with the potential to be windblown. All domestic waste discharge will be managed in accordance with the requirements of MARPOL 73/78 and the AMSA Marine Orders made under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983.

Hazardous and non-hazardous materials can be accidentally released to the marine environment through machinery failure, malfunction, or operator error (such as split hydraulic hoses releasing fluids), leaks from containment or inadequate clean-up of hazardous substances (such as following a split container), or if materials are lost overboard during bad weather or while transferring between vessels.

Routine discharges of biodegradable wastes have been assessed in **Section 7.3** and incineration of wastes have been assessed in **Section 7.4.** **Section 8.2** assesses the risks associated with unplanned release of hazardous materials specific to hydrocarbon liquids (spills). These are not considered further within this section. The following section deals with risks and impacts associated with accidental releases of hazardous and non-hazardous materials to the marine environment during the Otway Basin 3D MC MSS.

8.5.2 Evaluation of Known and Potential Impacts and Risks to Environmental Receptors

Using the information presented in **Section 4** to **Section 5**, the impact and risk assessment has been undertaken for those receptors determined to be relevant to the activity as listed in **Table 135**.

Table 135 Environmental Receptors Assessed

Receptor	Section reference
Marine environment quality (water quality)	**Section 8.5.2**
Plankton	
Marine fauna	
EPBC Act listed marine fauna	
Marine protected areas and sensitive areas	

The release of hazardous chemicals/liquid wastes has the potential to reduce water quality to a degree which poses risk to marine receptors. This could impact on marine organisms from plankton through to marine mammals, turtles, fish, and seabirds, either through direct exposure or because of ingesting prey within which toxic substances have bioaccumulated. The potential impacts associated with exposure to (hazardous and non-hazardous) wastes depend on a range of factors, including the toxicity, concentration and phase of the relevant compound and the nature of the exposure scenario itself. The amalgamation of these factors determines whether there is an observable effect, such as toxic, sub-lethal and lethal effects. The volume of hazardous materials that could potentially be released unintentionally from the survey vessels is small and, therefore, is likely to be rapidly dispersed and diluted to a point where concentrations are below levels expected to cause effects to marine organisms. In the event of an onboard spill, it is expected that hazardous waste would be contained on the vessel and cleaned up in accordance with the SOPEP and standard clean-up procedures, decreasing chances of a major release to the receiving marine environment.

Non-hazardous materials such as paper, cardboard, wood and packaging can also potentially cause impacts if accidentally released into the marine environment, including direct physical impacts to marine organisms (strangling, choking) or the benthic environment if materials sink (localised crushing, smothering), or indirect impacts related to a reduction in water quality (e.g. through the breakdown of materials into smaller components and/or leaching of chemicals into the water column).

Ingestion of wastes such as plastics has been identified as a threat within Recovery Plans, Conservation Advice, and Conservation Management Plans for several of the species identified as potentially present within the OA (**Table 32**). Of particular concern is the ingestion of wastes such as plastics by seabirds and marine turtles. Various species of seabird forage within the waters of the OA and wider Otway Basin, with these waters identified as important foraging areas (based on the identification of foraging BIAs) for 24 seabird species (**Table 31**). There are no foraging BIAs identified for marine reptiles within the OA, although loggerhead, leatherback, green, flatback, and hawksbill turtles may utilise waters of the OA.

Due to the offshore nature of the OA, and the localised nature of any unplanned releases, sensitive marine habitats are unlikely to be affected as these exist primarily on the seabed and/or in the nearshore environment. However, the Zeehan and Nelson AMPs and West Tasmanian Canyons KEF lie within the boundaries of the OA and the potential for an accidental release of hazardous and non-hazardous materials within these sensitive areas cannot be completely ruled out.

Extensive control measures will be in place to avoid any release into the marine environment (**Table 137**), although if a release did occur, it would be a highly localised event proportional to the size of the waste lost overboard, and effects would be temporary.

The residual risk to environmental receptors arising from an accidental release of hazardous and non-hazardous materials during the Otway Basin 3D MC MSS has been assessed as **Low** (*Minor* x *Unlikely*).

8.5.3 Decision Context

The decision context for the accidental release of hazardous and non-hazardous materials has been assessed as Type A given the predicted impacts and risks are well understood and uncertainty is minimal, with little or no interest from relevant persons.

8.5.4 Identification of Control Measures, Residual Risk Assessment and Demonstration of ALARP

Control measures that will be put in place during the Otway Basin 3D MC MSS to manage any potential impacts and risks from the accidental release of hazardous and non-hazardous materials to **ALARP** have been included in **Table 137**. TGS has considered a number of control measures to determine the benefits of their implementation towards risk reduction (**Table 137**), based on a Hierarchy of Controls methodology (**Table 136**). The control measures that will be adopted are those that have been assessed and characterised as effective and practicable to implement.

Table 136 Hierarchy of Control Measures for Accidental Release of Hazardous and Non-Hazardous Materials

Eliminate	Hazardous and non-hazardous wastes will be generated throughout the voyage as a result of critical operations required to support the activities and hazardous materials are required to keep the vessels operational, thus these cannot be completely eliminated from the Otway Basin 3D MC MSS.
Substitute	While the least harmful substance that will perform the specified role will be chosen during the survey, and materials with biodegradable/recyclable packaging will be used where possible, some materials cannot be safely substituted without placing greater risk on the vessel/crew and increasing risk of an accidental release.
Reduce	Waste storage areas will be tightly secured/closed and fitted with the relevant bunding to prevent accidental release overboard of materials. Equipment will be serviced and maintained appropriately, and operated only by trained and experienced personnel, to reduce risk of equipment failure which can lead to accidental releases.
Mitigate	Control measures have been assessed within **Table 137** to mitigate the risk of impacts from accidental release of hazardous and non-hazardous materials to **ALARP** levels. Those which are appropriate and are not impracticable or unfeasible due to disproportionately large costs will be implemented during the Otway Basin 3D MC MSS.

Table 137 Assessment of Control Measures for Accidental Release of Hazardous and Non-Hazardous Materials

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Legislative Requirements			
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	P = Yes E = Effective	All vessels undertaking an offshore activity in waters between 3 and 200 NM must undertake that activity in line with an approved EP. The approved EP outlines the measures that will be taken to ensure that environmental effects from the activity will be reduced to **ALARP** and **Acceptable Levels**, including the management of hazardous and non-hazardous materials.	Yes
In accordance with MARPOL Annex V and Marine Order 95: • Vessels over 100 gross registered tonnage (or certified for more than 15 persons on board) will have a Garbage Management Plan; and • Vessels over 400 gross registered tonnage (or certified for more than 15 persons on board) will have a Garbage Record Book.	P = Yes E = Effective	As per MARPOL Annex V, all ships of 100 gross tonnage and above, every ship certified to carry 15 persons or more must carry a Garbage Management Plan on board, which includes written procedures for minimizing, collecting, storing, processing and disposing of garbage, including the use of the equipment on board. As per MARPOL Annex V, all ships of 400 gross tonnage and above and every ship which is certified to carry 15 persons or more engaged in voyages to ports under the jurisdiction of another party to MARPOL to provide a Garbage Record Book and to record all disposal and incineration operations. It is a legislative requirement for vessels to comply with MARPOL, and Marine Order 95.	Yes
Management and storage of hazardous substances complies with regulations 2 to 5 of MARPOL Annex III: • Packages shall be adequate to minimise the hazard to the marine environment, having regard to their specific contents; • Packages containing harmful substances shall be durably marked with the correct technical name and, further, shall be durably marked or labelled to indicate that the substance is a marine pollutant. This shall be supplemented where possible by any other means (e.g. relevant United Nations number); • The method of marking and affixing labels shall be such that this information will still be identifiable on packages surviving at least three months' immersion in the sea • In all documents relating to the carriage of harmful substances by sea where such substances are named, the correct technical name of each substance shall be used and the substances further identified by the addition of the words 'MARINE POLLUTANT'; • Each ship carrying harmful substances shall have a special list or manifest setting forth the harmful substance on board and the location thereof. A detailed stowage plan setting out the location of the harmful substance may be used in place of such list or manifest. Copies of such documents shall be made available on request; and • Harmful substances shall be properly stowed and secured so as to minimise the hazards to the marine environment without impairing the safety of the ship and persons onboard.	P = Yes E = Effective	Regulations 2 to 5 of MARPOL Annex III outlines the regulations in place for the safe management and storage of hazardous substances. It is a legislative requirement for vessels to comply with MARPOL.	Yes
Vessels over 400 gross registered tonnage will hold an approved and tested SOPEP, with crew trained in its implementation.	P = Yes E = Effective	This control measure meets the requirements of Annex I of MARPOL which requires vessels over a certain size to have a SOPEP. Having crew trained in the implementation of the SOPEP will reduce the likelihood of a spill response option being required, by reducing the likelihood of a spill occurring in the first place. The Vessel Master is responsible for activating and implementing the vessel SOPEP. It is a legislative requirement for vessels to comply with MARPOL.	Yes
Good Industry Practice			
Solid hazardous and non-hazardous wastes generated during the Otway Basin 3D MC MSS are segregated onboard the vessel/s and are either incinerated or appropriately disposed of at a licensed onshore facility in accordance with the Waste Management Plan. All wastes will be stored in suitably capped/lidded receptacles to ensure they remain secure on the vessels under all conditions. Bins will be available for the segregation of waste as per the vessel's Waste Management Plan, and bins	P = Yes E = Effective	Ensuring all waste is securely stored aboard the vessels will prevent hazardous and non-hazardous wastes from being accidentally lost overboard into the marine environment. No domestic, maintenance, hazardous, solid or plastic waste will be intentionally discharged to the ocean. Such wastes will be stored onboard to be disposed at suitable facilities onshore. Bins will be used to segregate wastes on vessels in accordance with the vessel Waste Management Plan and covered bins will be used to prevent windblown waste.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
containing materials that have the potential to be wind-blown will be covered (e.g. using lids or netting).		The control is considered good practice, is well defined and established standard practice by the offshore petroleum sector. Good industry practice, environmental benefit outweighs any additional cost.	
Non-hazardous solid wastes will be recycled or re-used where practicable.	P = Yes E = Effective	Non-hazardous solid waste generated on board the vessel will either be recycled where practical or re-used. Good industry practice, environmental benefit outweighs any additional cost.	Yes
Bunding around stored hazardous substances and equipment that uses hazardous substances: • All hazardous substance storage areas will be designed and maintained to support some form of containment/bunding; and • All equipment located on the vessel's deck that uses hydrocarbons will be surrounded by primary bunding (e.g. deck edge lip), as a minimum.	P = Yes E = Effective	Containment/bunding will be in place around all locations where hazardous substances/materials are stored onboard the vessels to capture any spilled substances/materials and prevent them from entering the marine environment. Accidental release of materials may occur as a result of the use of machinery on deck. Bunding captures materials onboard the vessels and allows for an appropriate clean-up response, to avoid accidental release to the receiving marine environment. Good industry practice, environmental benefit outweighs any additional cost.	Yes
All hazardous substances carried onboard the vessels be recorded in a Hazardous Chemicals Register and accompanying Safety Data Sheets (**SDS**). All crew are to know where the register is stored.	P = Yes E = Effective	SDS contain detailed information about each hazardous substance and required information for handling and clean-up procedures in event of a spill, which will assist with minimising risk to the environment and workers in the event of an incident. Good industry practice, environmental benefit outweighs any additional cost.	Yes
Suitable spill kits will be located close to the location of hazardous substances to allow timely response and clean-up in the event of a spill/incident.	P = Yes E = Effective	Hazardous substances carried onboard the vessels will be stored in different areas and may require different methods to contain/clean-up a spill. Suitable spill kits will be located in close proximity to storage and areas of use to allow timely response and minimise the risk of release to the marine environment. Crew will be appropriately trained in the use of the spill kits. Good industry practice, environmental benefit outweighs any additional cost.	Yes
Deck scupper plugs will be available beside all deck drainage points that lead overboard.	P = Yes E = Effective	Deck scupper plugs allow for drainage to be blocked off, stopping wastes (including hazardous wastes) from entering the marine environment through deck drainage systems. Good industry practice, environmental benefit outweighs any additional cost.	Yes
All equipment shall be serviced and maintained in accordance with original manufacturer's specifications and the vessels planned maintenance schedules.	P = Yes E = Effective	To reduce the risks of equipment failure, leading to accidental release of hazardous/non-hazardous materials, all equipment should be serviced and maintained to detect early faults/defects that could cause failures. This control will reduce the likelihood of the risk of an accidental release of hazardous and non-hazardous materials. Good industry practice, environmental benefit outweighs any additional cost.	Yes
Vessels and equipment will be operated by trained and experienced crew and all crew will participate in the vessel and environmental induction prior to the commencement of operations.	P = Yes E = Effective	Accidental release of materials may occur as a result of improper/incorrect use of onboard equipment during normal operations. Crew will not operate equipment/machinery they are not trained/experienced in operating and will follow SOP or manufacturers guidelines for safe operation. This control will reduce the likelihood of the risk of an accidental release of hazardous and non-hazardous materials. It is a standard industry practice to hold inductions for all onboard the vessels, with participation in induction meetings compulsory. During inductions, crew will be made aware of their responsibilities with regard to effects of discharges to the marine environment and their roles with regard to clean-up of any accidental discharges. This control will reduce the likelihood of the risk of an accidental release of hazardous and non-hazardous materials. Good industry practice, environmental benefit outweighs any additional cost.	Yes

Control Measure	Practicability/ Effectiveness	Justification	Will it be adopted?
Alternative/Substitute Controls Considered			
All packaging and containers to be made of biodegradable materials.	P = No E = Somewhat Effective	Some materials/substances carried onboard cannot be safely contained within biodegradable containers and attempting to do so may place crew at greater danger and increase risk of incident which could result in risk to environment. Due to the potential increase in risk to crew and the environment, this control measure is not considered appropriate in reducing the impacts to ALARP.	No
Additional Control Measures Considered:			
No generation of hazardous/non-hazardous wastes onboard the vessels which require storing.	P = No E = Very Effective	Health and safety of crew requires that foods, materials, and equipment be appropriately packaged for storage onboard the vessels for use at a later date, thereby generating packaging wastes which must be stored aboard the vessels to be later disposed of onshore. Costs would be disproportionate to the benefit that may be gained.	No
Residual Risk of Impact and Risk (Receptor)	**Consequence**	**Likelihood**	**Risk Ranking**
All receptors (outlined in **Section 8.5.2**).	Minor	Unlikely	Low
ALARP Statement:			
The decision context has been assessed as Type A and the overall residual risk has been determined to Low. TGS considers the adopted control measures minimise the risk of impacts from the accidental release of hazardous and non-hazardous material and are appropriate to the localised nature and small scale of the predicted environmental impacts associated with the Otway Basin 3D MC MSS. The proposed control measures have been developed in accordance with the legislative requirements, good industry practice, using professional experience and taking into account the specific environmental, social, economic and cultural characteristics of the OA. Additional control measures were considered as part of the assessment process; however, it was considered that they were not reasonably practicable to implement. Therefore, the predicted impacts to receptors from the accidental release of hazardous and non-hazardous materials are reduced to **ALARP.**			

8.5.5 Impact and Risk Acceptability

Table 138 Demonstration of General Risk Acceptability for Accidental Release of Hazardous and Non-Hazardous Materials

Criteria for Acceptance	Acceptability Summary
Residual Risk Ranking	The residual risk has been determined to be Low.
Ecologically Sustainable Development	The management of the risk associated with an accidental release of hazardous and non-hazardous materials can be carried out in compliance with the five principles of ESD as defined within the EPBC Act. These principles have been considered as part of the development of this EP and risk assessment process. The assessment has not identified any adverse impacts to the principles of ESD, with no threats of serious or irreversible damage, no impacts to biological diversity and ecological integrity, no degradation of inter-generational equity, or negative effects on the social and economic integrity in the short or long-term.
TGS Internal Context	The proposed management of the risks associated with the establishment of IMS is consistent with TGSs QHSE Policy commitments of: • Protecting the environment; and • Conducting operations in an environmentally sustainable and responsible manner.
Existing Environmental Context	The release of hazardous wastes into the marine environment can adversely impact on marine environmental (water) quality and, subsequently marine species, biodiversity ecosystem function, social amenity and human health. Marine debris such as plastic wastes and/or packaging can potentially pose a risk for many marine organisms, including protected species, through multiple impact pathways, for example ingestion, entanglement, chocking and smothering. Impacts to water quality and marine organisms resulting from the unplanned release of hazardous and non-hazardous substances are expected to be minor, temporary, highly localised and, in the case of non-hazardous materials, proportional to the size of solid waste. Hazardous substances accidentally released into the marine environment would be quickly diluted and/or dispersed. Therefore, impacts to marine organisms are not expected. Of relevance to the OA, are the maintenance of management objectives and values for protected areas such as the Zeehan and Nelson AMPs and the West Tasmanian Canyons KEF. Following the implementation of proposed control measures, the potential risk of impacts to marine environmental quality, marine receptors and, therefore, protected areas from the accidental release of hazardous and non-hazardous materials is Low.
External Context – Management Plans, Species Recovery Plans and Conservation Advice	The residual risk of the accidental release of hazardous and non-hazardous materials has been determined to be Low and will not have a significant impact on a matter of national environmental significance in accordance with EPBC Act Policy Statement 1.1. **Section 4.5.8** provides an outline of the EPBC Act Conservation Management Plans, Recovery Plans and Conservation Advice relevant to the species identified as potentially present within the OA and/or EMBA for the Otway Basin 3D MC MSS. Marine debris causing entanglement and ingestion was recognised in 2003 as a key threatening process for marine vertebrates under the EPBC Act. Pollution generally is also identified as a threat in several conservation advices/recovery plans for EPBC-listed species potentially occurring within the OA and/or EMBA. TGS has reduced and, where possible, eliminated any adverse impacts of marine debris from the activities of the seismic survey on turtles, cetaceans, sharks and birds, noting the linkages with the *Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life* (Commonwealth of Australia, 2018). The control measures in place during the Otway Basin 3D MC MSS will support the implementation of this threat abatement plan and will ensure the Otway Basin 3D MC MSS is undertaken in a manner that is consistent with the species-specific Management Plans, Recovery Plans, and Conservation Advice. The OA overlaps with two AMPs within the South-East Marine Parks Network: the Zeehan and Nelson AMPs. Management of discharges in accordance with the requirements of MARPOL meets the management prescriptions outlined for AMPs and will minimise the potential for the release of wastes in AMPs
Social Acceptance – Relevant Person Expectations	Concerns were raised by relevant persons around the potential for rubbish to accumulate on beaches as a result of discharges from the Survey Vessels operating for the Otway Basin 3D MC MSS. Concerns were also raised by relevant persons around the potential for hazardous substances to detrimentally affect stocks of commercially harvested kelp. Concerns were raised by relevant persons around the potential for hazardous substances to detrimentally affect stocks of commercially harvested kelp. TGS has committed to zero rubbish disposed at sea and with the strict control measures in place to ensure there are no accidental releases of hazardous and non-hazardous substances into the marine environment, the risk of environmental impacts relating to the accidental releases of hazardous and non-hazardous materials from survey vessels are considered to be at a socially **Acceptable Level.**
External Context – Commonwealth and State Legislative Criteria	The proposed control measures during the Otway Basin 3D MC MSS are consistent with the following relevant standards/documents: • MARPOL Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form; • MARPOL Annex V Prevention of Pollution by Garbage from Ships; • The Protection of the Sea (Prevention of Pollution from Ships) Act 1993; • Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014; • Marine Order 95 (Marine pollution prevention – garbage) 2013; and • Marine Notice 2017/4 MARPOL Annex V Discharges.
Industry Best Practice	The proposed control measures to decrease the risk of an accidental release of hazardous and non-hazardous materials follows industry best practice and best practice guidelines for MSSs, including: • The IAGC Environmental Manual for Worldwide Geophysical Operations which recommends that: - No direct discharge of any products into the sea;

Criteria for Acceptance	Acceptability Summary
	- Vessels have a waste of garbage management plan in line with relevant regulations and providing procedures for collecting, segregating, storing, processing, and disposing of garbage; - Ensure that any hazardous materials used by the crew are handled and stored correctly, and that the safety information provided by the manufacturer is available to the crew - Waste that cannot be disposed by incineration is segregated and stored for disposal ashore; and - Keep complete records of hazardous material purchases, use, storage, disposal, and spills according to local or company requirements ; • The APPEA Code of Environmental Practice which recommends that suitable waste management practices are used based on preventing, minimising, recycling, treating and disposing of wastes in accordance with any statutory requirements and procedures.
ALARP	Hazardous and non-hazardous wastes will be generated throughout the survey voyage as a result of critical operations required to support the activities associated with the Otway Basin 3D MC MSS, and hazardous materials are required to keep the vessels operational. Therefore, hazardous and non-hazardous wastes cannot be completely eliminated from the Otway Basin 3D MC MSS and there are no practicable alternatives. Following the implementation of the control measures, the potential risk of impacts to the marine environment and associated receptors associated with the release of hazardous and non-hazardous materials are likely to be temporary and highly localised. Based on the assessment above, including the potential impacts on the environment and the associated controls measures to be implemented, the residual risk of an accidental release of hazardous and non-hazardous materials from the survey vessels is considered to be **Low** and to **ALARP** levels. Therefore, the impacts from this activity associated with the Otway Basin 3D MC MSS are considered to be at an **Acceptable Level**.

Acceptability Statement
Impacts and risks classified as 'Type A' are considered acceptable if the requirements in **Table 51** can be demonstrated and it can be determined that the predicted levels of impact and/or residual risk are at or below pre-defined Acceptable Levels for that impact or risk, including those described in **Table 52.** Based on the above evaluation, the potential impacts from the accidental release of hazardous and non-hazardous materials meets the requirements of the risk acceptability criteria. The control measures that will be implemented throughout the Otway Basin 3D MC MSS have been developed in accordance with these criteria and are considered appropriate to manage the impacts of the accidental release of hazardous and non-hazardous materials to an **Acceptable Level.**

8.5.6 Environmental Performance

Table 139 Environmental Performance Outcomes, Standards and Measurement Criteria for Accidental Release of Hazardous and Non-Hazardous Materials

Number	Environmental Performance Outcome	Environmental Performance Standard(s)
EPO 29	No accidental release of hazardous and non-hazardous materials into the marine environment	**EPS 298** to **EPS 321**
EPO 30	Management of hazardous and non-hazardous waste to meet or exceed the requirements of MARPOL Annex V and Marine Order 95	**EPS 298** to **EPS 321**

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
The Otway Basin 3D MC MSS will be undertaken in accordance with the approved EP.	**EPS 298**: The Otway Basin 3D MC MSS may only commence following acceptance of the EP by NOPSEMA.	Pre-mobilisation audit and inspection are completed prior to operations and confirm an accepted EP has been obtained. Audit records verify compliance with the requirements of the EP.	TGS VOM EA
	EPS 299: The Otway Basin 3D MC MSS will be undertaken in accordance with the accepted EP.	Bridge logs verify compliance with the requirements of the EP. Audit records verify compliance with the requirements of the EP.	TGS VOM VOC EA Vessel Master SEA
In accordance with MARPOL Annex V and Marine Order 95: • Vessels over 100 gross registered tonnage (or certified for more than 15 persons on board) will have a Garbage Management Plan; and • Vessels over 400 gross registered tonnage (or certified for more than 15 persons on board) will have a Garbage Record Book.	**EPS 300**: Each vessel utilised during the Otway Basin 3D MC MSS that is over 100 gross registered tonnage (or certified for more than 15 persons on board) holds a Garbage Management Plan	Pre-mobilisation inspection confirms that each vessel > 100 gross registered tonnage (or certified for more than 15 persons on board) holds a Garbage Management Plan	TGS VOM VOC Vessel Master
	EPS 301: Each vessel utilised during the Otway Basin 3D MC MSS that is over 400 gross registered tonnage (or certified for more than 15 persons on board) holds a Garbage Record Book	Pre-mobilisation inspection confirms that each vessel > 400 gross registered tonnage (or certified for more than 15 persons on board) holds a Garbage Record Book	TGS VOM VOC Vessel Master
Management and storage of hazardous substances complies with regulations 2 to 5 of MARPOL Annex III. • Packages shall be adequate to minimise the hazard to the marine environment, having regard to their specific contents; • Packages containing harmful substances shall be durably marked with the correct technical name and, further, shall be durably marked or labelled to indicate that the substance is a marine pollutant. This shall be supplemented where possible by any other means (e.g. relevant United Nations number);	**EPS 302**: Packaging will be adequate to minimise the hazard to the marine environment, having regard to their specific contents.	Pre-mobilisation inspection confirms that each vessel > 400 gross registered tonnage holds a Garbage Record Book	Party Chief SEA CSR
	EPS 303: Packages containing a harmful substance shall be durably marked with the correct technical name (trade names alone will not be used) and shall be durably marked or labelled to indicate that the substance is a marine pollutant and include the common technical name, UN Classification and CAS numbers.	Pre-mobilisation audit records confirms packaged harmful substances are stowed in accordance with MARPOL Annex III.	Party Chief SEA CSR
	EPS 304: The method of marking the correct technical name and of affixing labels on packages containing a harmful substance shall be such that this information will still be identifiable on packages surviving at least three months immersion in the sea. In considering suitable marking and labelling, account shall be taken of the durability of the materials used and of the surface of the packaging.	Pre-mobilisation audit records confirms packaged harmful substances are stowed in accordance with MARPOL Annex III.	Party Chief SEA CSR
	EPS 305: A stowage plan is to be displayed with the location of harmful substances onboard and these substances are to be stored in the locations identified in this plan.	Pre-mobilisation audit records confirms packaged harmful substances are stowed in accordance with MARPOL Annex III.	Party Chief SEA CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
• The method of marking and affixing labels shall be such that this information will still be identifiable on packages surviving at least three months immersion in the sea; • In all documents relating to the carriage of harmful substances by sea where such substances are named, the correct technical name of each substance shall be used and the substances further identified by the addition of the words 'MARINE POLLUTANT'; • Each ship carrying harmful substances shall have a special list or manifest setting forth the harmful substance on board and the location thereof. A detailed stowage plan setting out the location of the harmful substance may be used in place of such list or manifest. Copies of such documents shall be made available on request; and • Harmful substances shall be properly stowed and secured so as to minimise the hazards to the marine environment without impairing the safety of the ship and persons onboard.	**EPS 306**: Hazardous substances are to be properly stored and secured so as to minimise the hazards to the marine environment without impairing the safety of the ship and crew onboard.	Pre-mobilisation audit records confirms packaged harmful substances are stowed in accordance with MARPOL Annex III.	Party Chief SEA CSR
Vessels over 400 gross registered tonnage hold and approved and tested SOPEP, with crew trained in its implementation.	**EPS 307**: SOPEP formulated, known to all staff, and kept up to date onboard the vessels so that in the event of a collision where hydrocarbons are released there is a plan in place to contain or clean-up.	Pre-mobilisation audit and inspection prior will confirm vessels holds an up-to-date SOPEP. Induction records show content of induction meeting and participation of crew.	Vessel Master. Party Chief SEA CSR
	EPS 308: The Vessel Master will authorise actions in accordance with the vessel specific SOPEP and survey specific SOPEP to avoid, and where avoidance is not possible, minimise the escape of hydrocarbons.	Incident Report from a hydrocarbon spill response will confirm whether SOPEP has been followed.	Vessel Master. Party Chief.
	EPS 309: Notification procedures will be implemented, including AMSA and regulatory agencies, including: • AMSA report notification; • NOPSEMA reports; • Regulatory agencies (including DNP); • TGS incident report; and • Pollution report.	In event of vessel collision/sinking and release of MDO all appropriate forms will be completed and submitted to relevant authorities	TGS VOM Vessel Master.
Solid hazardous and non-hazardous wastes generated during the Otway Basin 3D MC MSS are segregated onboard the vessel/s and are either incinerated or appropriately disposed of at a licensed onshore facility in accordance with the Waste Management Plan. All wastes will be stored in suitably capped/lidded receptacles to ensure they remain secure on the vessels under all conditions. Bins will be available for the segregation of waste as per the vessel's Waste Management Plan, and bins containing materials that have the potential to be wind-blown will be covered (e.g. using lids or netting).	**EPS 310**: Details of solid wastes incinerated or transferred to shore are maintained in the vessel's Waste Management Log Book, including records of the receiving company for transferred wastes.	Audit records show content of Waste Management Log Book and appropriate disposal of wastes at onshore facility.	Party Chief SEA CSR
	EPS 311: Generated solid wastes will be separated and securely stored in tightly capped/lidded containers/areas for later disposal onshore. Generated wastes will be characterised and managed in accordance with MARPOL Annex V, Marine Order 94 and Marine Order 95.	Pre-mobilisation inspection confirms suitable storage areas for generated wastes which are labelled and have appropriate means of preventing wastes from escaping.	Party Chief SEA CSR
	EPS 312: Bins will be available for the segregation of waste as per the vessel's Waste Management Plan. bins containing materials that have the potential to be wind-blown will be covered (e.g. using lids or netting).	Pre-mobilisation inspection confirms suitable storage areas for generated wastes which are labelled and have appropriate means of preventing wastes from escaping.	Party Chief SEA CSR

Control Measure	Environmental Performance Standard	Measurement Criteria	Responsible Party
Non-hazardous solid wastes will be recycled or re-used where practicable.	**EPS 313**: Environmental induction includes information on waste management and housekeeping requirements, including recycling or re-using waste where practicable.	Induction records show content of induction meeting and participation of crew.	Vessel Master. Party Chief. EA
Bunding around stored hazardous substances and equipment that uses hazardous substances: • All hazardous substance storage areas will be designed and maintained to support some form of containment/bunding; and • All equipment located on the vessel's deck that uses hydrocarbons will be surrounded by primary bunding (e.g. deck edge lip), as a minimum.	**EPS 314**: Hazardous storage areas (e.g. hydrocarbons and chemicals) will be fully bunded and drain to the bilge water tank treatment system. Spill response kits will be stored nearby the storage location of these hazardous substances for clean-up purposes in the event of an unplanned spill.	Audit records confirm location of stored hazardous substances, the spill kit and appropriate bunding.	Party Chief SEA CSR
	EPS 315: All equipment located on the vessel's deck that uses hydrocarbons will be (as a minimum) surrounded by primary bunding (e.g. deck edge lip).	Pre-mobilisation inspection confirms appropriate bunding is in place around relevant deck machinery/equipment.	Party Chief SEA CSR
All hazardous substances carried onboard the vessels be recorded in a Hazardous Chemicals Register and accompanying SDS. All crew are to know where the register is stored.	**EPS 316**: Hazardous materials must be recorded in a Hazardous Chemicals Register with accompanying SDS. All hazardous materials will be appropriately stored and handled in accordance with the relevant SDS requirements and the International Maritime Dangerous Goods Code to reduce the risk of an environmental incident. SDS for all hazardous substances (as defined in the International Maritime Dangerous Goods Code) onboard the vessel will be kept readily available in locations known to all crew.	Pre-mobilisation inspection confirms a Hazardous Chemicals Register is in place and includes the correct and in-date SDS for all hazardous substances are readily available to all crew.	Party Chief SEA CSR
Suitable spill kits will be located close to the location of hazardous substances to allow timely response and clean-up in the event of a spill/incident.	**EPS 317**: Spill kits of appropriate size and composition for the type/class of hazardous substance will be located close to location of these hazardous substances. Crew will be appropriately trained in how to use the spill kits and how to properly dispose of any soiled spill kits following clean up.	Pre-mobilisation inspection confirms correct type and size of spill kit and their proximity to the hazardous substance location. Induction records show crew are appropriately trained in how to use the spill kits.	Party Chief SEA CSR
Deck scupper plugs will be available beside all deck drainage points that lead overboard.	**EPS 318**: Scupper plugs, or equivalent drainage control measures, will be readily available to allow drains to be blocked in the event of a hydrocarbon or chemical spill to deck (i.e. outside bunded areas).	Audit records confirm location of drainage control measures. Induction records show crew are appropriately trained in how to implement scupper plugs.	Party Chief SEA CSR
All equipment shall be serviced and maintained in accordance with original manufacturer's specifications and the vessels planned maintenance schedules.	**EPS 319**: Risk of equipment failure (leading to accidental material releases) reduced by service and maintenance according to vessel SOP, original equipment manufacturer's recommendations and vessel service schedule.	Pre-mobilisation inspection confirms equipment is in current test/ certification and maintenance records show completed work.	Party Chief SEA CSR
Vessels and equipment will be operated by trained and experienced crew and all crew will participate in the vessel and environmental induction prior to the commencement of operations.	**EPS 320**: All equipment to be correctly operated only by trained and experienced staff.	Induction records show which crew hold suitable certification/training to operate equipment.	Vessel Master. Party Chief.
	EPS 321: All crew will participate in a vessel induction prior to the commencement of the survey, outlining their roles and responsibilities while onboard. Induction is to include information on waste management and housekeeping requirements.	Induction records show content of induction meeting and participation of crew.	Vessel Master. Party Chief. EA

8.5.7 Accidental Release of Hazardous and Non-Hazardous Material Impact and Risk Summary

Based on the assessment above, including the potential impacts on the environment and the associated controls measures to be implemented, the residual risk of an accidental release of hazardous and non-hazardous materials from the survey vessels is considered to be **Low.**

The suite of control measures to be implemented have been developed in accordance with industry best practice, and all relevant legislation. Consequently, it is considered that the environmental impacts and risk on the marine environment and receptors arising from the accidental release of hazardous and non-hazardous material from the Otway Basin 3D MC MSS, are reduced to **ALARP** levels.

In accordance with the acceptability requirements prescribed in **Section 6.4,** the suite of control measures is considered appropriate to manage the risks and impacts arising from the accidental release of hazardous and non-hazardous material from the Otway Basin 3D MC MSS on all receptors to an **Acceptable Level**.

9 Cumulative Effects

Cumulative effects due to exposure to seismic energy may occur under the following scenarios:

- Consecutive/successive MSSs, where the spatial footprint of impacts from previous MSSs have occurred over the same area where impacts from the Otway Basin 3D MC MSS are predicted to occur. Cumulative impacts will only occur where the effects of previous MSSs overlap the same area and when recovery of the impacts from these MSSs has not occurred prior to the commencement of the Otway Basin 3D MC MSS;
- Multiple MSSs that occur concurrently in a region. Effects may or may not overlap spatially, but may result in an incremental increase in impacts within the range and extent of the same environmental receptors, e.g. where different MSSs overlap with the distribution of the same population of a marine species or with the same commercial fishery;
- Multiple exposures during a single MSS, including infill of seismic data gaps within the same MSS; and
- Interaction between different sources of sound, e.g. vessel noise and seismic energy.

Any of these scenarios could increase the overall underwater sound exposure for key receptors to levels that are above those associated with the conduct of a single MSS. Acoustic energy from multiple MSSs and shipping traffic are of particular interest as these are the two most likely potential contributors to cumulative effects of underwater noise in the Otway Basin. There is also a high likelihood that infill of seismic data gaps will be required. The noise impacts of infill lines have been identified throughout **Section 7.2**.

This section does not assess cumulative impacts from MSSs that are not yet planned (i.e. for which no EP has yet been submitted to NOPSEMA), which may occur in the same timeframes as, or after, the Otway Basin 3D MC MSS. It is not possible to anticipate what surveys will be planned and it is expected that proponents of future MSSs assess the potential cumulative impacts of their surveys with the Otway Basin 3D MC MSS within their respective EPs.

9.1 Characterising the Nature and Scale of Cumulative Effects

Potential cumulative impacts from successive MSSs on receptors are highly variable based on the recovery period of the receptors and the timing between the surveys. As outlined throughout **Section 7.2**, the range at which the various receptors recover from sounds exposure can be between minutes and hours, through to weeks and months; examples of the recovery periods for the key receptors are as follows:

- Zooplankton abundance (including eggs and larvae) will likely recover and replenish to natural levels within hours of exposure as discussed within **Section 7.2.2.2.1**;
- Benthic invertebrates may experience sub-lethal and chronic effects for weeks to months as outlined within **Section 7.2.2.2.1**. However, it is worth noting that any effects on the community composition are considered to be negligible in relation to natural variability;
- Potential effects on fish species are dependent on the species and their hearing sensitivity, but effects will likely last for minutes to hours as discussed in **Section 7.2.2.3.2**; and
- Changes in migrating or foraging marine fauna (e.g. cetaceans and marine turtles) will likely return to normal within hours or days after exposure as outlined within **Section 7.2.2.2.6** and **Section 7.2.2.2.7**.

Based on the discussions above, the longest potential recovery period relates to immobile benthic invertebrate communities, although noting that those effects are considered negligible in relation to the natural variability of those communities.

9.2 Concurrent and Consecutive Marine Seismic Surveys

A review of data available on the National Offshore Petroleum Information Management System (**NOPIMS**) and the NOPSEMA website has confirmed the MSSs that have previously been undertaken in South Australian, Otway, and TAS offshore waters in the last 5 years (2018 – 2023 inclusive). The NOPIMS and NOPSEMA website were also checked for any recently approved EPs for potential spatial and/or temporal overlap with the Otway Basin 3D MC MSS; this did not identify any other MSSs in the region so no further assessment of cumulative impacts with consecutive MSSs can be undertaken.

Overall, four historical MSSs were identified through this process, with their details provided in **Table 140** and locations depicted in **Figure 93**.

Table 140 Previous 2D and 3D MSSs completed in the Vicinity of the Otway Basin 3D MC MSS in the last Five Years

Survey Name	Acquisition Period	Spatial Overlap
Beach Energy Prion 3D MSS	08/11/2021 - 11/12/2021	None. The MSS was located in the western Bass Strait, 150 km east of the OA.
ConocoPhillips Sequoia 3D MSS	15/08/2021 - 31/10/2021	Overlap between the south-west corner of the Sequoia 3D MSS OA and the Otway Basin 3D MC MSS OA. Minor overlap between the south-west corner of the Sequoia 3D MSS AA and the Otway Basin 3D MC MSS AA, although no operation of the seismic source will occur here during the Otway Basin 3D MC MSS due to the implementation of the Giant Crab Acoustic Exclusion Zone.
Schlumberger Otway Basin 2D MC MSS	16/01/2020 - 21/04/2020	Overlap. The area where 2D seismic lines were acquired during the SLB Otway Basin 2D MC MSS is broadly similar to the Otway Basin 3D MC MSS AA.
T/30P Geophysical and Geotechnical Seabed Survey	Mid-2021	Overlap with the Otway Basin 3D MC MSS OA near the 2D tie line AA.

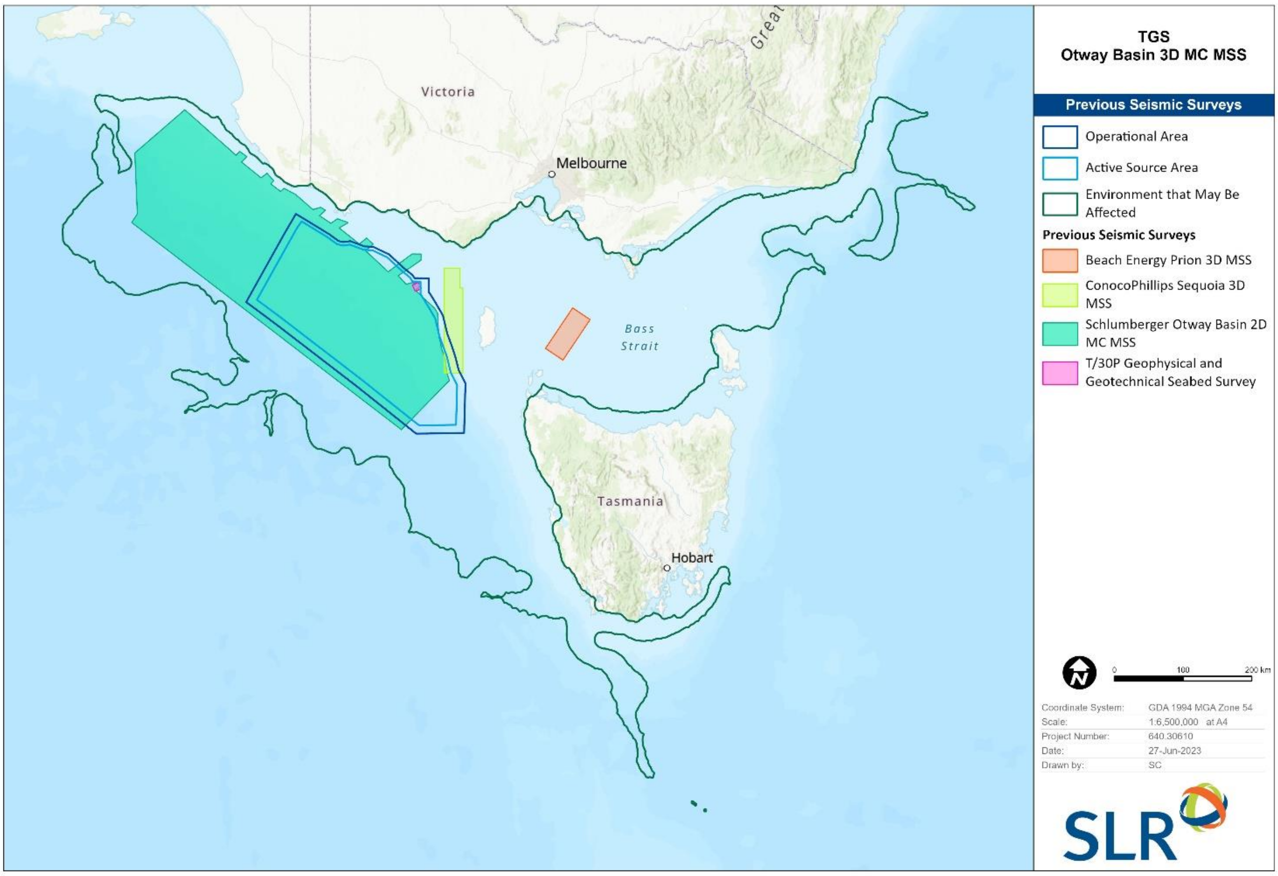


Figure 93 Previous Seismic Surveys Acquired since 2018 in the Otway Basin

Given that seismic activity has not been undertaken within or close to the OA since the start of 2022, ecological receptors are expected to have recovered. As a result, there is not expected to be any potential for cumulative impacts on marine receptors from seismic energy released from the previous MSSs. In addition, recent research indicates that short-term (acute) noise exposures (like those associated with MSSs) are less likely to affect marine species at a population level compared to long-term (chronic) noise exposures (Ellison *et al.*, 2016).

TGS is aware that CGG are also proposing to undertake the Reggia 3D MSS in the Otway Basin and are currently going through the consultation process and commencing the process for gaining regulatory approval through the development of an EP. The timing of the Reggia survey is not known at this stage, but TGS are in communications with CGG and have made a commitment to working together to minimise or reduce the potential for any cumulative acoustic disturbance within the OA or wider Otway Basin.

Similarly, TGS is also aware of the Calico 3D transition survey that is proposed by Beach Energy in Victorian state waters within three nautical miles of the shoreline. The proposed survey area is a long way inshore from the OA; however, TGS will continue to work with Beach Energy to minimise any potential for cumulative impacts should both surveys be acquired at the same time.

Seismic Vessel availability in Australia typically prevents more than one MSS being undertaken in a region at the same time, and although this cannot be guaranteed it is unlikely that both the TGS and CGG MSS's would be acquired simultaneously. TGS will engage with any additional proponents identified as having potential concurrent seismic activities within the Otway Basin, GAB or Bass Strait offshore areas prior to commencing a survey phase. Consistent with international good practice in the geophysics industry, a minimum separation distance of 40 km shall be maintained between the Otway Basin 3D MC MSS acoustic source and other operating acoustic sources. A SIMOPs Plan will also be developed and implemented if a separate petroleum activity is undertaken concurrently with the Otway Basin 3D MC MSS and within the OA. These control measures have been discussed in **Table 84**.

9.3 Multiple Exposures to the Acoustic Source

During the acquisition of seismic data, occasional gaps in data coverage occur. This can arise due to a variety of causes, such as malfunction of seismic equipment, minor navigational errors causing the vessel to move off-track, data errors, or enforced periods of non-acquisition due to interactions with marine species, weather constraints or vessel issues. These data gaps may negatively impact on the overall integrity and usefulness of the seismic data and prevent the objectives of the Otway Basin 3D MC MSS being achieved. Critical gaps in the seismic data coverage require 'infilling' where the Seismic Vessel is required to return to acquire data for a second time across the affected area. However, infill acquisition does not typically exactly replicate the original line but instead occurs slightly adjacent (typically 500 – 1,000 m) to it[41]. The time interval between initial data acquisition and infill acquisition depends on a variety of factors, such as data processing, vessel scheduling, local conditions, and competing data priorities. Infill lines typically need to be rescheduled at a later date as it is inefficient to immediately turn the Seismic Vessel to traverse the same area. Often infill lines will be left to the end of the survey schedule.

While infill acquisition has the potential to expose marine species, particularly less mobile benthic invertebrates, and site-attached species, to a second dose of seismic energy, it is noteworthy that for those marine fauna most at risk the UAM results (**Appendix B**) predict that:

- For crustaceans sublethal effects are predicted within c. 500 m of the acoustic source, but physiological effects for bivalves, sponges and corals are not predicted at any distance. Indeed, Przeslawski *et al.* (2016) concluded that none of the most recent studies (i.e. Parry *et al.*, 2002; Harrington *et al*., 2010; Aguilar de Soto *et al.,* 2013; Day *et al.*, 2016) indicate that MSSs cause mortality to benthic shellfish (scallops) under realistic exposure scenarios. Furthermore, Przeslawski *et al.* (2016) state that effects of seismic surveys on abundances have not been detected for cephalopods, bivalves, gastropods, decapods, stomatopods, or ophiuroids (Wardle *et al.,* 2001; Parry *et al.*, 2002; Christian *et al.,* 2003; Parry and Gason, 2006). These scientific results indicate that MSSs are unlikely to impact site-attached benthic species populations.
- For fish, no injury (mortal or recoverable) is predicted beyond c. 150 m from the acoustic source and while TTS could occur to a maximum of 4.8 km from the source, it is contingent on sustained exposure over a 24-hour period.

Given that infill acquisition is typically displaced by 500 – 1,000 m, and considering the UAM results summarised above, cumulative injury effects from infill acquisition are not anticipated for benthic invertebrates or site attached fish. In addition, exposure levels that could elicit TTS in site attached fish are not expected on either the primary or infill acquisition pass (even if both occurred within 24 hours of each other) as continuous 24-hour exposure of fish to sound exposure levels associated with close proximity of the acoustic source (i.e. within 4.8 km) will not occur on account of continuous vessel movement.

[41] Pers. Comm A. van der Wal, TGS. 22 June 2023.

Similar levels of cumulative exposure will occur when adjoining lines (less than 1 km parallel to each other) are acquired sequentially. Such exposure is routinely expected given the proposed 'racetrack' layout of the Otway Basin 3D MC MSS (as discussed in **Section 3.5.3**). The findings presented above for infill scenarios also apply to the sequential acquisition of adjoining lines and any other repeat acquisition that might be required, i.e. that cumulative injury effects are not anticipated for site attached marine fauna and TTS effects on fish are operationally untenable.

It is also noteworthy that re-shooting some areas may be necessary (on account of marine mammal instigated shut-downs, etc). The key differences between infill acquisition and re-shooting are that 1) re-shooting aims to replicate the original sail line, but 2) re-shooting occurs if acquisition was shut-down on the initial pass; hence cumulative exposure effects from re-shooting are not predicted as re-shooting does not subject an area to repeat exposure to seismic noise.

9.4 Multiple Sound Sources

Cumulative noise impacts can also occur due to seismic activities overlapping with existing background noise in and around the OA, such as from vessel traffic. **Section 4.7.4** provides details on the shipping activity that occurs in the general Otway Basin. The 'background' noise levels associated with shipping are known to affect the communication calls between marine mammals due to 'masking', whereby calls are not as easily heard above the noisy background. Masking is a complex phenomenon and masking levels are difficult to predict for any combination of sender, environment, and receiver characteristics (Erbe *et al*., 2016). The Otway Basin 3D MC MSS will comprise several vessels: one Seismic Vessel, and two smaller ancillary vessels including a Support/Chase Vessel and a Supply Vessel. Consequently, the increase in vessel noise will be small compared to the regular acoustic disturbance generated by commercial vessels traversing the OA.

Australia's south coast, including the Otway Basin, is transited by large commercial vessels, hence shipping noise is an existing feature of these waters, and marine mammals that are resident within the area are likely to have adapted to the persistent background noise. In the presence of constant noise, marine mammals sometimes adapt their vocalisations in order to overcome the effects of masking (e.g. McGregor *et al*., 2013) (further described in **Section 7.2.2**). In contrast, marine mammals that seasonally migrate through the OA are more likely to experience masking effects from vessel noise and noise generated during the Otway Basin 3D MC MSS.

The cumulative effects of exposure to multiple sound sources may be more relevant at the population level on a chronic basis than at the individual level on an acute basis (Ellison *et al*., 2016), and therefore introducing short-term (acute) seismic-based noise to an area that has an existing high background of vessel noise, such as the Otway Basin, is unlikely to impact marine species at the population level.

Marine environments differ in their resilience to anthropogenic stressors (Ban *et al*., 2010), and the potential for cumulative effects is likely to be related to physical features such as water depth, seabed characteristics and coastline shape. A higher risk from noise is evident in shallow waters and enclosed bays where the attenuation potential is lower, whereas open coastlines and deep water (such as within the OA of the Otway Basin 3D MC MSS) allow sound to dissipate more rapidly and therefore the risk is lower.

9.5 Conclusions

The potential for cumulative noise impacts associated with the proposed Otway Basin 3D MC MSS is low considering that:

- The last MSS conducted in the vicinity of the Otway Basin 3D MC MSS was completed at the end of 2001. Given the time that has elapsed since previous MSSs were undertaken in this area, all receptors are expected to have recovered from the effects of previous MSSs prior to commencement of the Otway Basin 3D MC MSS. Therefore, cumulative impacts to ecological receptors are not expected to occur as a result of any of the identified previous MSSs in the region and the Otway Basin 3D MC MSS;
- TGS is not aware of any potential MSSs that may overlap (spatially and temporarily) with the Otway Basin 3D MC MSS. Should TGS become aware of another MSS being approved for these areas, TGS will engage with proponents identified as having potential concurrent seismic activities within the Otway Basin, GAB or Bass Strait offshore areas prior to commencing a survey phase. A minimum separation distance of 40 km shall be maintained between the Otway Basin 3D MC MSS acoustic source and other operating acoustic sources. A SIMOPs Plan will also be developed and implemented, if a separate petroleum activity is undertaken concurrently with the Otway Basin 3D MC MSS and within the OA;
- The necessity of infilling critical gaps in the seismic data is not expected to significantly increase sound exposure impacts on marine species, especially since the deep, open ocean environment of the OA will ensure continual movement and mixing of the water mass, and the minimum time between undertaking infilling; and
- Additional vessel noise associated with the survey vessels will be small compared to the background noise associated with marine traffic and fishing. The introduction of short-term (acute) seismic-based noise to this area that has an existing high background of vessel noise is unlikely to impact marine species at a population level.

10 Implementation Strategy

Regulation 14 of the Environment Regulations requires an EP to contain an implementation strategy. As outlined within NOPSEMA Guidance Note N04751-GN1344 A339814, there are four key elements that an implementation strategy should include, these are:

- An environmental management system consistent with AS/NZS ISO 14001;
- Provision of reporting, monitoring, recording, audit, management or non-conformance and review of the titleholder's environmental performance to ensure that EPOs and EPSs in the EP are being met;
- An OPEP and demonstration that appropriate arrangements are in place for the activation of this plan in the event of a spill; and
- Arrangements for continuing consultation with relevant authorities, persons and organisations in order to demonstrate that there is an effective two-way communication process in place between the titleholder and relevant person.

It is TGS' responsibility for ensuring that the Otway Basin 3D MC MSS is managed in accordance with this implementation strategy. Likewise, all project personnel (employees and contractors) are expected to comply with the requirements of this EP at all times for the duration of the activity.

The following sections detail the implementation strategy which will be employed for the duration of the Otway Basin 3D MC MSS and associated activities and the methods in which TGS will conform to the requirements of Regulation 14. The OSMP (as part of the OPEP in **Section 10.10.8**) has been developed as a stand-alone document and is therefore separate to this EP but provided in **Appendix O**.

10.1 TGS Environmental Management System

As defined within Regulation 4 of the Environment Regulations, an Environmental Management System includes the responsibilities, practices, processes and resources used by a properly resourced and competent organisation to manage the environmental aspects of an activity.

The design and implementation of TGS Health Safety and Environmental Management System (**HSE-MS**) is underpinned by the key commitments stated within the TGS Environmental Policy and Health and Safety Policy (**Appendix A**). TGS' integrated HSE-MS is consistent with the management framework outlined within the AS/NZS ISO 14001 – Environmental Management Systems.

TGS' HSE-MS is designed to meet or exceed all appropriate legal requirements and, in the absence of any defined standards, meet or exceed industry-wide good industry practice. By employing TGS's Statement of Values and the principles of Leadership, Risk Management and Continuous Improvement, a high level of safety awareness shall always be maintained.

TGS senior management shall demonstrate leadership and commitment with respect to the HSE-MS by:

- Taking overall responsibility and accountability for the prevention of work-related injury and ill health, as well as the provision of safe and healthy workplaces and activities;
- Ensuring that the HSE policies and related HSE objectives are established and are compatible with the strategic direction of the organisation;
- Ensuring the integration of the HSE-MS requirements into the organisation business processes;

- Ensuring that the resources needed to establish, implement, maintain and improve the HSE-MS are available;
- Communicating the importance of effective HSE management and of conforming to the HSE-MS requirements;
- Ensuring that the HSE-MS achieves its intended outcome;
- Directing and supporting persons to contribute to the effectiveness of the HSE-MS;
- Ensuring and promoting continual improvement;
- Supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility;
- Developing, leading and promoting a culture in the organisation that supports the intended outcomes of the HSE-MS;
- Protecting workers from reprisals when reporting incidents, hazards, risks and opportunities;
- Ensuring the organisation establishes and implements a process for consultation and participation of workers; and
- Supporting the establishment and functioning of health and safety committees.

TGS and its contractors will apply a tiered approach to optimising the environmental performance of the project to ensure TGS' EPOs are achieved. The approach involves identification of local and regional environmental sensitivities, prioritization of risks, determination of appropriate practices and procedures to reduce those risks, and clear designation of roles and responsibilities for implementation.

A series of work instructions, procedures, plans and tools (e.g. spatial files) will be used for works undertaken within the OA to ensure that appropriate management measures are applied as required to minimise the risk of environmental disturbance from the Otway Basin 3D MC MSS. The work instructions, procedures and plans are documented within corporate systems/manuals developed by TGS as well as documents written specifically for the Otway Basin 3D MC MSS undertaken within the OA. The Vessel Operations Contractor shall have a suite of procedures that may apply to all vessels in their fleet; however, the associated work instructions are generally vessel specific.

Specific procedures comprising the HSE-MS that support the Otway Basin 3D MC MSS and comply with the Regulation 14 of the OPGGS (E) Regulations include but are not limited to:

- HSE-SOP-010 Risk Management;
- HSE-SOP-611 Contractor Management;
- HSE-SOP-311 Training;
- HSE-SOP-023 Communications;
- HSE-SOP-025 Management of Change;
- HSE-SOP-024 Audit and Review Process;
- HSE-SOP-140 Vessel Inspection;
- HSE-SOP-401 Emergency Preparedness and Response; and
- HSE-SOP-021 Incident Reporting and Investigation.

TGS uses HSE-MS software, Cority, to support incident management and tracking of performance.

10.2 Roles and Responsibilities

As stated in the NOPSEMA Guidance Note (N-04750-GN1344 A339814), a clear definition of the roles and responsibilities of all personnel involved in the Otway Basin 3D MC MSS ensures effective and consistent implementation of all the environmental management requirements set out in this EP and TGS' commitments to reducing potential impacts to the receiving environment to **ALARP** and an **Acceptable Level**.

While the respective Vessel Master has the overall responsibility to maintain health and safety standards for everyone on-board the survey vessels, it is the responsibility of all TGS employees and contractors to adhere to the requirements of any HSE-MS and the approved EP to ensure that their work is carried out in a safe manner and in a way that minimises any further potential risk to the receiving environment.

There is a clear chain of command for personnel implementing, managing and reviewing this EP provided below in **Figure 94**, with **Table 141** outlining the roles and responsibilities further.

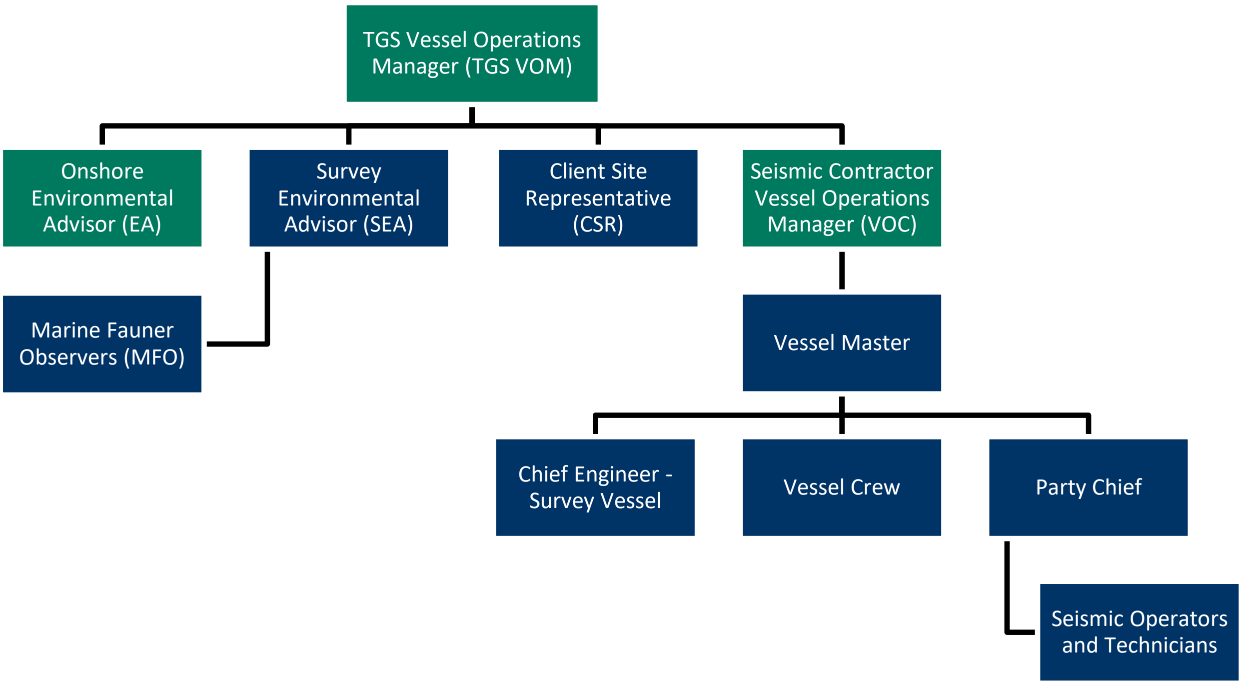


Figure 94 Chain of Command for Implementing, Managing and Reviewing the EP

Table 141 Roles and Responsibilities during the Seismic Survey

Role	Responsibility Relevant to this EP
Shore Personnel	
TGS Vessel Operations Manager (**TGS VOM**)	• Ensure the activity is undertaken as per the EP; • Provide sufficient resources to implement management measures to achieve the performance objectives of the EP; • Responsible for hiring qualified and experienced personnel, including contractors; • Manage change requests for the activity and notifying the Survey Environmental Adviser (**SEA**) of any scope changes in a timely manner; • Liaise with regulatory authorities such as NOPSEMA, NOPTA and AMSA as required; • Ensures communication is maintained with any other titleholders undertaking an MSS in the Otway Basin if/where SIMOPS is required; • Review the EP as necessary; • Ensure the programme's contractual obligations in relation to environmental management are met by the survey vessel operator; • Ensure that an annual internal audit of TGS' environmental management framework is carried out; • Ensure that audits of contractor HSE management systems are carried out annually or with every new contractor, whichever is more frequent; • Ensure environmental incident reporting meets regulatory requirements (as outlined in the EP) and TGS' internal HSE Incident Reporting Procedure; • Monitor and close out corrective actions raised from environmental inspections/audits or incidents; • Commit necessary resources to facilitate an emergency response strategy in the event of an incident; • Manage TGS' emergency response strategy in the event of an incident, including monitoring of response actions conducted by third parties such as vessel operators and designated combat agencies e.g. AMSA; • Review results of compliance audit during the program and make recommendations where required; • Ensure that all reportable and recordable incidents are reported to NOPSEMA; • During survey(s), ensure monthly reporting requirements to NOPTA and Ingress Grantors are undertaken; • Ensure that a full briefing to all project personnel is provided, including details of the environmental sensitivities of the survey area and environmental management procedures and performance outcomes detailed in this EP; • Responsible for all consultation activities and ensures that continuing consultation with relevant persons is carried out in a manner that is consistent with TGS' consultation strategy (**Section 5**) and control measures; • Ensure that a post-survey Environmental Performance Report is prepared and submitted to NOPSEMA; • Liaise directly with Seismic Contractor's onshore management team regarding all matters pertaining to the EP, survey and support vessels' activity; • Responsible for compliance with HSE Plan, ISM (International Safety Management) code, local, flag state, port state and class requirements for assigned vessels.

Role	Responsibility Relevant to this EP
Seismic Contractor Vessel Operations Manager (**VOC**)	• Ensure the activity is undertaken as per the EP; • Ensure that the following documents are onboard and implemented: ○ HSE plan; ○ Project plan; ○ Emergency response procedures; ○ HSE management procedures; ○ Hazard management procedures; ○ Environmental management procedures; • Ensure seismic and maritime personnel on survey and support/chase vessels are aware of their role and/or responsibility with regards to the EP and compliance with the EP commitments; • Responsible for compliance with HSE plan, International Safety Management Code, local, flag state, port state and class requirements for assigned vessels; • Responsible to ensure investigations are initiated on maritime events including breakdowns; • Responsible to follow up on maritime incidents and that corrective actions are identified and implemented; • Responsible to capture lessons learned and ensure Experience Transfers are issued; • Ensures latest copies of all survey-related documentation is available and on board all vessels involved in the survey, including support/chase vessel; • Ensure all offshore personnel are made available for Project Inductions and are signed-off accordingly.
Onshore Environmental Advisor (**EA**)	• Prepare and revise the survey EP as necessary; • Prepare environmental induction and vessel inspection information; • Provide a briefing to project personnel and survey vessel crew members of the environmental sensitivities of the survey area, environmental management procedures and performance objectives detailed in the EP as part of the environmental induction process; • Assist with review, investigation and reporting of environmental incidents; • Ensure environmental inspections/audits are undertaken as per the requirements of the EP; • Ensures all relevant continuing consultation which may impact the Otway Basin 3D MC MSS or relevant persons is communicated to personnel offshore, as required; • Assist in preparation of external regulatory reports required for the survey, in line with environmental approval requirements and TGS incident reporting procedures; • Assist in the preparation of the Annual Report (if required)
Vessel Personnel	
Vessel Master	• Ensure the safe execution of all operations of the vessel; • Comply with all relevant State, Federal and International laws relating to vessel; • Overall responsibility for HSE management aboard the vessel; • Ensure that appropriate control and mitigation measures are implemented to minimise potential environmental effects resulting from vessel operations (e.g. waste management/disposal; fuel/oil spill response);

Role	Responsibility Relevant to this EP
	• Immediately notify the Client Site Representative (**CSR**) and SEA of any incidents/activities arising from vessel operations that are likely to have a negative impact on the performance outcomes detailed in this EP; • Support the CSR in ensuring that all relevant HSE documents are understood and adhered to; • Ensure compliance with this EP, and any relevant statutory regulations (e.g. vessel discharges to sea); • Ensure that vessel procedures and systems comply with the EPO, EPS and MC described in this EP; • Report hydrocarbon or other chemical spillage to AMSA, the CSR and SEA; • Establish and maintain radio contact with other vessels in the OA and adjacent waters; • Provide SEA with any requested environmental compliance-related documents, tables, procedures and work instructions.
Chief Engineer Survey Vessel	• Overall responsibility for operation and maintenance of engines, generators and other machinery aboard the survey vessel; • Verify that the vessel's computerised planned maintenance system is used and updated and includes critical components and how to address them; • Select the correct survey modes for each machinery component, with special regard to fuel economy and life time costs for the different components; • Verify that engine room log, oil record book and other logs are kept according to laws, regulations and vessel contractor's instructions; • Have the daily supervision of the running of all machinery, including engines, compressors, and propulsion and power supplies; • Be responsible for the maintenance in the engine department; • Be responsible for waste management systems dealing with sewage, grey water, putrescible wastes and bilge water.

Party Chief	• Ensure safe execution of all operations carried out by the seismic crew aboard the survey vessel;
	• Ensure that the following documents are aboard and implemented;
	  ○ HSE Plan;
	  ○ Project Plan;
	  ○ Emergency Response Procedures;
	  ○ HSE Management Procedures;
	  ○ Hazard Management Procedures;
	  ○ Environmental Management Procedures; and
	  ○ This EP.
	• Ensures the seismic operations are consistent with:
	  ○ TGS Environmental Policy;
	  ○ Bridging document between TGS and seismic contractor for the operation of the survey vessel if required;
	  ○ TGS and seismic contractor plans, procedures and work instructions;
	  ○ This EP; and
	  ○ Relevant environmental legislative requirements or regulatory conditions.
	• Provide a daily log of activities and environmental incidents to the CSR;

Role	Responsibility Relevant to this EP
	• Ensure that appropriate control measures are implemented to minimise potential environmental impacts resulting from seismic acquisition; • Ensure compliance with all aspects of HSE reporting and for investigations of all incidents and near misses; • Immediately notify the CSR and SEA of any incidents/activities arising from seismic operations that are likely to have a negative impact on the EPOs detailed in this EP.
Client Site Representative (**CSR**)	• Ensure that the following documents are understood and adhered to; ○ HSE Plan; ○ Project Plan; ○ Emergency Response Procedures including survey vessel SOPEP; ○ HSE Management Procedures; ○ Hazard Management Procedures; ○ Environmental Management Procedures; and ○ This EP. • Facilitate clear communications between the TGS Perth office, the TGS Director, TGS VOM and the survey vessel personnel; • Ensure that during the Otway Basin 3D MC MSS operations within the OA all sub-contractors perform operations in a manner consistent with the environmental management procedures and EPOs detailed in this EP; • Ensure that the Vessel Master and Party Chief are adhering to the requirements of this EP; • Ensure that he/she is fully aware of ongoing operations, particularly for environmentally critical activities; • Immediately alert the TGS VOM of any changes in operations that could have a negative impact on environmental performance; • Immediately report any reportable incidents to the TGS VOM; • Maintain records of daily logs, environmental incidents, waste inventory and marine fauna sightings provided by the Party Chief, SEA and MFOs; • Assist in the preparation of the Annual Report (if required); • Before each affected line commences, confirms first and last shot point (including soft start location) are in the correct location and outside of exclusion zones and correct source capacity is selected for water depth.
Survey Environmental Adviser (**SEA**)	• Adhere to the EP as necessary; ensure all seismic activities are undertaken in accordance with the EP and that all staff on the seismic vessel and support/chase vessel are properly inducted and aware of the conditions of the EP; • Prepare and maintain the Environmental Compliance Register (**ECR**); • Record and collate all measurable performance outcomes of the EP within the ECR; • Prepare environmental induction and vessel inspection information. • Provide a briefing to project personnel and survey vessel crew members of the environmental sensitivities of the OA, environmental management strategies, EPO, and EPS detailed in the EP as part of the environmental induction process; • Assist the MFO team with visual observations and required Policy Statement 2.1 reporting for cetacean interactions;

Role	Responsibility Relevant to this EP
	• Assist MFOs and monitor for the presence of marine fauna; • Assist with review, investigation and reporting of environmental incidents; • Provide suitable support (i.e. training and materials) to assist the main seismic vessel and support/chase vessel crews with the correct identification and reporting of cetacean and other marine fauna; • Check and verify the accuracy of HSE totals provided in the daily and weekly reports, based upon independent observation of the events noted in the reports; • Ensure environmental inspections/audits are undertaken as per the requirements of the EP; • Assist in preparation of external regulatory reports required for the survey, in line with environmental approval requirements and the TGS HSE incident reporting procedures; • Assist in the preparation of the Annual Report (if required); • Bring to the immediate attention of CSR and TGS VOM any actions that are not compliant with the EP. Any recordable incidents will be logged within the ECR; • SEA will confirm the acoustic source is not located within exclusion zones or outside of the operational area prior to commencement of the acoustic source array and ensures that shapefiles of environmental sensitivities are correctly loaded onto all the navigation systems that define the boundaries where the acoustic source cannot be active within the OA, as well as the MFO and PAM observers computer system is provided to all those required that will need it to implement control measures. The shapefiles will include exclusion areas associated with marine mammals (blue whale and southern right whale), AMP boundaries, Tasmanian Giant Crab Fishery and UXO boundaries..
Marine Fauna Observers (MFO)	• Maintain watch for marine fauna during the course of the survey and advise the CSR and Party Chief of the presence of these marine fauna; • Implement Part A Standard Management Procedures and additional Part B Additional Management Procedures as identified in this EP; • Monitor and record any interactions with cetaceans and other marine fauna; • Assist in the preparation of the MFO Final Report.
PAM Operators	• Deployment and maintenance of PAM equipment; • Maintenance of 24-hour monitoring (day and night) of PAM equipment for acoustic detections of cetacean presence; • Maintenance of communication with Vessel Master, Party Chief, MFOs and Seismic Operator to initiate mitigation measures such as shut-downs of acoustic source; and • Preparation of cetacean survey reports (in collaboration with MFO) that detail any cetacean detections, interactions, and mitigation actions taken.
Seismic Operators Technicians	• Apply operating procedures in letter and in spirit; • Follow good housekeeping procedures and work practices; • Encourage improvement in environmental performance wherever possible;

Role	Responsibility Relevant to this EP
	• Immediately report environmental incidents or spillage of >1 L of hydrocarbons or other chemicals to the Vessel Master and Party Chief; • Before each affected line commences, Chief Navigator confirms first and last shot point (including soft start location) are in the correct location and outside of exclusion zones and correct source capacity is selected for water depth; • Seismic Navigators will confirm seismic acquisition lines entered into the integrated navigation system are not located within exclusion zones or outside of the AA including confirming the start of line and end of line location are located only within AA.
Vessel Crew	• Responsible for applying non-seismic vessel operating procedures in a professional and safe manner with good housekeeping procedures and work practices; • Includes personnel responsible for food and accommodation for all crew, watch-keeping and vessel navigation and compliance with local and international laws of the sea; • Ensure that any incidents are immediately reported to the Vessel Master.

10.2.1 Communications

Effective communications contribute to the achievement of HSE-MS requirements. To ensure this occurs, the communications processes within this EP are underpinned by TGS' Communications Procedure (HSE-SOP-023).

The Vessel Master is responsible for keeping the vessel crew informed about environmental issues, acting as a focal point for personnel to raise environmental issues, and consulting and involving all personnel in the following areas:

- Issues associated with the implementation of the EP;
- Any proposed changes to equipment, systems, or methods of operation of plant, where these may have potential environmental implications; and
- Any proposals for the continuous improvement of environmental protection, including the setting of environmental outcomes and training schemes.

Weekly Safety (or HSE) Meetings will be held onboard each vessel used for the duration of the Otway Basin 3D MC MSS with minutes recorded for all items and issues discussed and the resulting action items within the HSE Minutes of Meeting Form. The minutes of each meeting, including action items from the meetings, will be made available to all personnel following the meeting. Information which may be covered within the Safety Meeting are described within TGS' Communications Procedure and include, but are not limited to, incident investigations and hazard/near miss reports.

Other forms of internal communication include daily Toolbox Meetings, which are undertaken at the start of each day, at the start of each shift, and before every critical or unfamiliar job. Toolbox Meetings include all personnel involved in the task and cover a review of the hazards, designate responsible persons as required and a review of contingency measures. Additionally, they include aspects such as daily work plans, status of environmental controls, housekeeping, weather, repairs or maintenance and spill prevention requirements. A record of the meeting must be kept using the Toolbox Meeting Form.

Any concerns or issues that arise in relation to environmental performance/requirements of the EP will be recorded and communicated through:

- Personnel related issues/concerns raised are to be communicated with the Vessel Master and are communicated/recorded in daily meetings if required; and
- Infield communications with fishing and shipping activities is managed by the Vessel Master/crew and recorded on the vessel log (i.e. any vessel within the OA must follow mariners' warnings and navigational requirements and/or agreed controls under this EP).

Continuing consultation with relevant persons identified in this EP throughout will occur throughout the Otway Basin 3D MC MSS, as described in **Section 5.5.12.** The TGS VOM will communicate any updates determined through the continuing consultation process to the Vessel Master, where they have the potential to impact the Otway Basin 3D MC MSS and/or relevant persons.

10.3 Training, Competencies and Awareness

The correct selection, placement, training and ongoing assessment of competent employees and contractors is a key component of any offshore activity in order to ensure that operations meet all organisational, and statutory requirements, including the requirements of the approved EP. Essentially, this means that all personnel onboard the vessels have to be competent to undertake their roles and responsibilities.

Specific responsibilities are detailed in job descriptions and appropriate training will be provided to individuals with specific environmental responsibilities, in accordance with TGS' Training Procedure (HSE-SOP-311), such as waste management measures; routine discharges; and deployment and recovery of streamer procedures. Training may be in the form of inductions, 'on the job', internal courses or external courses.

TGS will ensure the vessel operator provides marine crew who are trained and competent to undertake their respective activities on-board the vessel. All marine personnel will be qualified in accordance with the International Convention on Standards of Training Certification and Watch Keeping for Seafarers (**STCW95**) or Elements of Shipboard Safety as relevant. It is the responsibility of the Vessel Contractor will ensure all offshore personnel employed for the Otway Basin 3D MC MSS are sufficiently trained and competent for their role onboard the vessels.

10.3.1 Contractor Management

TGS has developed a systematic approach to qualify, evaluate, select, and manage contractors so that the associated HSE risks are identified and properly managed, and applicable legislative, regulatory and industry standards are adhered to. The engagement of contractors is a two-stage process that involves completion of a contractor pre-qualification form and the assessment of their HSE management systems. This is intended to ensure that only contractors whose HSE Management Systems are compatible with or have an equal or higher standard than that of TGS' HSE-MS are utilised. All contracts for the Otway Basin 3D MC MSS will be established with minimum requirements as detailed in the TGS' Contact Management Procedure (HSE-SOP-611) and include but are not limited to vessel specific plans, project-specific Contractor HSE management plans, a Master of Services agreement (formerly bridging document), relevant insurances and certificates. TGS engages with its subcontractors in reviewing HSE-related documents.

The requirements of this EP will be rolled out to contractors through the following processes:

- The requirement to comply with the approved EP will be included in contracts for vessels;
- A copy of the approved EP and OSMP will be provided to the vessel operators by TGS;
- A Contractor HSE Plan may be required to acknowledge, as appropriate, relevant commitments in the EP;
- Possible physical inspection of the contractor's facilities and/or equipment;
- All contractor personnel are competent and trained for the roles and responsibilities they are contracted for and will be able to provide relevant CVs which reflect this;
- All contractor personnel will be required to attend an HSE induction; and
- Continuous monitoring of Contractor HSE performance.

A review of contractor compliance with the relevant EPSs will be initiated prior to mobilisation.

Once engaged, Contractor HSE performance is tracked and catalogued through TGS' HSE-MS software application, allowing TGS to continuously monitor its contractors' performance throughout the project life cycle and over time. TGS monitors and assesses the performance of contractors by tracking and reviewing a range of leading and lagging HSE indicators. Upon completion of a survey, TGS reviews all aspects of HSE performance to identify and discuss areas for improvement, lessons learned, and additional hazards identified during the acquisition phase. In addition to the review, monitoring and audit requirements set out in this EP, TGS completes an organisational review of HSE statistics and performance, including those for contractors, on a quarterly basis.

10.3.2 Vessel Master

The Vessel Master will possess the appropriate qualifications, experience, and skill to command the vessel as required by AMSA for the tonnage and vessel class to be utilised.

As part of the induction process (**Section 10.3.6**), the Vessel Master will meet with the Onshore EA and CSR to familiarise themselves with the project and EP requirements, the Contractors HSE Plan, and the Bridging Document. While the Vessel Master has the overall responsibility to maintain health and safety standards for everyone on-board the survey vessels, the CSR will be present and verify this has occurred at the conclusion of this meeting. Likewise, the Vessel Master will ensure the CSR is aware of and understands all the requirements set out in the approved EP, at the conclusion of this meeting.

During this meeting, the Vessel Master and CSR will review the accuracy and completeness of Contractors HSE Plans, the Bridging Document and the shape files denoting key environmental sensitivities to be avoided, against the boundary extents of the AA and OA, to ensure they are adequate for further circulation.

10.3.3 Survey Environmental Advisor

The SEA will possess the appropriate qualifications, experience, and skill to oversee compliance with the requirements of the approved EP.

While the Vessel Master has the overall responsibility to maintain health and safety standards for everyone on-board the survey vessel, the SEA has responsibility for ensuring the requirements of the EP are implemented and appropriately met in an effective and consistent manner. The CSR will provide secondary check of adherence to the requirements of the EP. Hence, they are commonly cited as responsible persons for a given control measure and EPS.

To achieve this, it is expected that the SEA will have experience exceeding that described for MFOs (**Section 10.3.5**). As a minimum, the SEA will have logged a minimum of 20 week's relevant sea-time engaged in MSS operations in Australian waters as an environmental advisor or MFO.

The SEA will be issued a copy of the approved EP, the Contractors HSE Plan, any relevant tools and workflows from the CSR. As part of the induction process (**Section 10.3.6**), the SEA will meet with the Onshore EA, MFOs and PAM Operators to familiarise themselves with the project and EP requirements, as they relate to their roles. The CSR will be present to verify the SEA is aware of and understands all the relevant requirements set out in the approved EP, at the conclusion of this meeting.

10.3.4 Marine Biofouling Inspector

As detailed in **Table 109**, a qualified marine biologist will provide a written report on the biofouling inspection carried out on the survey vessels. The inspector will be suitably trained and competent to carry out the biofouling inspection. This experience will be identified by their professional CVs and records of relevant past experience. To be classed as 'suitably trained and competent', the following criteria will be considered when contracting a marine biologist for the purpose of the biofouling inspection:

- Knowledge and experience:
- Experience and qualifications in the marine environment and marine quarantine/biosecurity fields. For example, BSc or MSc in marine biology and relevant industry experience;
- Knowledge and understanding of applicable legislation (see **Section 2.1**);
- Additional evidence provided on a case-by-case basis such as relevant experience, sectors covered, specialist work, professional memberships, and research conducted in the biosecurity field; and
- Maintenance of experience – maintains knowledge, ability and experience through conducting at least three IMS inspections every two years and demonstrates a commitment to ongoing professional development to remain up to date with inspection methods and technology.
- Fit and proper person:
- History of complying with relevant biosecurity legislation and reporting suspected and confirmed IMS; and
- No convictions in relation to honesty or fraud under any written law or history of making false or misleading records of returns.
- Ability:
- Demonstrated ability to determine IMS likely to be present on the vessel;
- Demonstrated ability to effectively inspect internal sea water systems and topsides, and to prepare briefings for divers and dry inspection teams;
- Demonstrated ability to deliver a dry inspection and in-water inspection, to identify IMS and deliver biofouling inspection reports; and
- Demonstrated ability to provide accurate advice relating to risk minimisation in accordance with relevant legislation, policies and guidelines, remediation and corrective measures, and ongoing management and best practice to achieve and maintain a low risk status.

The Marine Biofouling Inspector will undertake an evaluation of the risk profile of the survey vessel/s prior to vessel entry into Australian waters, during recent dry-docking or during inspection of the hull and niche areas, as required, and which concludes a low risk of IMS presence. The Marine Biofouling Inspector is not included in the chain of command and will not be required to attend project specific inductions as they have no role onboard the vessel following mobilisation from port. The Marine Biofouling Inspector will be contracted in accordance with the requirements set out in **Section 10.3.1.**

10.3.5 MFOs and PAM Operators

Policy Statement 2.1 requires MFOs to have '*proven experience in whale observation, distance estimation and reporting*'. Two dedicated, trained, and experienced MFOs will be contracted for the Otway Basin 3D MC MSS to undertake observations on the Seismic Vessel. An additional two dedicated, trained, and experienced MFOs will be stationed on the Attending Support Vessel to provide marine fauna observations from a secondary platform.

TGS will employ dedicated, trained, and experienced MFOs, as identified by their professional CVs and records of relevant past experience. Due to the sensitivity towards mammals in the OA and the 7 km Extended Shut-down Zone for BW/PBW and SRW and the Extended 2 km Shut-down Zone for other whales that will be implemented throughout the OA for the duration of the Otway Basin 3D MC MSS (**Section 3.5**), the following minimum level of experience will be required for the MFOs:

- The lead MFO on the Seismic Vessel must have logged a minimum of 20 weeks' relevant sea-time engaged in MSS operations in Australian waters as an MFO (following the recommendation of the Marine Mammal Observer Association (MMOA, 2019));
- All MFOs must have proven 'at sea' experience in whale identification and behaviour, and distance estimation, and must be confident in the identification of those species that the EP predicts will be present in the OA (as stated in this EP); and
- All MFOs will hold a JNCC Marine Mammal Observation certification (or equivalent).

In addition, two dedicated, trained, and experienced PAM Operators will be contracted for the Otway Basin 3D MC MSS to undertake acoustic monitoring for marine mammals from the Seismic Vessel. PAM Operators employed during the Otway Basin 3D MC MSS will need to be dedicated, trained, and experienced in the use of PAM for the detection and monitoring of cetacean vocalisations. Experience will be identified by their professional CVs and records of relevant past experience. The following minimum level of experience will be required for the PAM Operators:

- The lead PAM Operator must have logged a minimum of 20 weeks' relevant sea-time engaged in MSS operations in Australian waters as a PAM Operator (following the recommendation of the Marine Mammal Observer Association (MMOA, 2019));
- All PAM Operators will need to be able to demonstrate competency in the acoustic identification of the species that are likely to be present during the Seismic Survey (as stated in this EP). Noting that the ability to acoustically detect some species (e.g. blue whales) is limited; and
- All PAM operators must demonstrate competency in interpreting acoustic software and estimating distance to any detected whale calls.

MFOs and PAM Operators will be aware of the requirements of Policy Statement 2.1 Part A procedures and adopted Part B procedures. The Lead MFO and the Lead PAM Operator will also have experience with the preparation of compliance and sighting reports (see **Section 10.6.2**).

All MFOs and PAM Operators will be issued a copy of the approved EP, the Contractors HSE Plan, with respect to the MFOs this will take the form of the Marine Fauna Management Plan, and any relevant tools and workflows from the CSR. As part of the induction process (**Section 10.3.6**), MFOs and PAM Operators will meet with the Onshore EA and SEA to familiarise themselves with the project and EP requirements, as they relate to their roles no less than one week prior to mobilisation. The CSR will be present to verify MFOs and PAM Operators are aware of and understand all the relevant requirements set out in the approved EP, at the conclusion of this meeting.

10.3.6 Environmental Inductions

In accordance with Regulation 14(5) of the OPGGS (E) Regulations each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the EP, including during emergencies or potential emergencies. Therefore, as a minimum, all TGS employees and contractors will be required to attend a survey-specific environmental induction prior to the commencement of operations. The induction will be conducted to ensure everyone's awareness and compliance with the approved EP. This may occur prior to the project commencing or during the project as new or replacement personnel are employed. The environmental component of the induction will cover awareness and compliance aspects of the approved EP, including:

- Environmental regulatory and reporting (environmental incidents or hazards) requirements (i.e. Policy 2.1 requirements);
- Environmental sensitivities (including other marine users), heritage and conservation values within the EMBA, and the key impacts/risks associated with the Otway Basin 3D MC MSS;
- Overview of activities that have highest risk for an impact and associated response and management procedures;
- Overview of Project HSE Plan and Emergency Response Procedure;
- Roles and environmental responsibilities of key personnel onboard the vessels;
- As a minimum, the control measures and relevant EPSs, EPOs and measurement criteria, as they relate to:
- The relevant requirements of Policy Statement 2.1;
- Marine fauna likely to be in the area;
- Marine fauna sighting procedures;
- Marine fauna interaction requirements;
- Protocols for communicating and interacting with any commercial fishers in the OA;
- Waste and chemical management requirements;
- Housekeeping and spill prevention; and
- Spill preparedness and response, the SOPEP, OSMP and OPEP.
- Importance of following procedures and using JHAs to identify environmental risks and control measures;
- Roles and environmental responsibilities, including during emergencies or potential emergencies;
- Overview of what constitutes a reportable and recordable incident and internal and external reporting requirements

- HSE expectations including reporting to key personnel onboard the survey vessels
- Roles and responsibilities, triggers and processes effected under the Management of Change; and
- Workflows which have been developed to successfully implement any of the above

As summarised above, all vessel crew will be given an overview and presentation during the induction process regarding the requirements of the environmental management systems that are contractor specific as well as requirements of the EP. All crew will be required to become familiar with these systems and contractor specific requirements.

The vessel contractor will conduct their own company and vessel-specific inductions independently of the induction summarised above. This induction will include the management of HSE risks to vessel personnel that are associated with working in the offshore environment, which are not related to the implementation of the EP. Communication of HSE issues will typically be through the daily Toolbox Meetings and weekly HSE meetings.

All personnel who undertake the induction will be required to sign an attendance sheet, which is retained by the Seismic Contractor VOC. All vessel-based personnel will be required to conform to all applicable guidelines and requirements for management of HSE issues. All crew on board the vessel/s will be made aware of and will be required to become familiar with the requirements of both the contractor specific environmental management systems as well as the EP during the activity induction process.

In conjunction with the contractor specific training and awareness activities described in **Section 10.3.2** to **Section 10.3.5**, the actions required to ensure all TGS employees and contractors are suitably inducted, in accordance with the implementation strategy, are summarised in **Table 142.**

Table 142 Environmental Induction and Training and Awareness Schedule

Personnel (Attending)	Personnel (Leading)	Information covered	Timing
Vessel Master CSR	Onshore EA	All Contractors HSE Plan(s), and the Bridging Document, Environmental Induction[42]	Prior to Environmental Induction, no less than one week prior to mobilisation
SEA MFOs CSR	Onshore EA	Contractors HSE Plan(s), the Marine Fauna Management Plan, Environmental Induction	Prior to Environmental Induction, no less than one week prior to mobilisation
Vessel Master Chief Engineer Survey Vessel MFOs PAM Operators Party Chief Seismic Operator Technician(s) CSR	Onshore EA/SEA	Marine Fauna Mitigation Plan	Prior to Environmental Induction, no less than one week prior to mobilisation

[42] Information covered is as described for Environmental Inductions in **Section 10.3.6**

Personnel (Attending)	Personnel (Leading)	Information covered	Timing
All other TGS employees and contractors	Onshore EA/CSR	Environmental Induction	Prior to pre-mobilisation audit/Prior to mobilisation[43]

10.4 Review of Environmental Performance

The development of this EP resulted in various control measures, EPOs, EPSs and relevant measurement criteria to ensure the control measures are operating to reduce the impacts and risks to **ALARP** and **Acceptable Levels**. These provisions have been based on various pieces of legislation (**Section 2**) to provide a suite of control measures (**Sections 7** and **8**) that ensure the levels of environmental performance specifically defined in the EP are met.

As per Regulation 14(6) of the Environment Regulations, TGS will continue to monitor the environmental performance of the control measures during the duration of the Otway Basin 3D MC MSS to ensure that:

- The EPOs and the associated EPSs are being met. This will be done through a review process which will ensure that, where necessary, the EPSs can be amended to maintain the management of impacts and risks to the receiving environment to **ALARP** and an **Acceptable Level**, as per the EPOs contained within the EP;
- Any opportunities for improvement are identified promptly to further reduce potential impacts and risks, and any non-conformances are identified to allow appropriate corrective action to be undertaken;
- Compliance with TGS' policies, manuals and procedures;
- All required monitoring requirements have been undertaken prior to the completion of the Otway Basin 3D MC MSS; and
- Any concerns raised by relevant persons during or after completion of the Otway Basin 3D MC MSS are followed up by an appropriate liaison, as required.

The key aspects and objectives of TGS' environmental performance review process, include:

- Ensuring sufficient monitoring and recording is undertaken (**Section 10.4.1**);
- Maintenance of accurate records as required within the Environment Regulations (**Section 10.4.2);**
- Undertaking auditing to ensure the processes and systems adopted are effective (**Section 10.4.3**);
- The management of non-conformances (**Section 10.4.4**);
- The review of the EP to continuously look for ways to improve operations during the Otway Basin 3D MC MSS (**Section 10.4.5**); and
- The Management of Change, if required (**Section 10.4.6**).

Findings of the environmental performance review will be used to inform continuous improvement throughout the duration of the Otway Basin 3D MC MSS and for use in future surveys, as appropriate. Further, any such findings will be incorporated into the Environmental Performance report that TGS will submit to NOPSEMA.

[43] Applicable to all TGS employees and contractors deployed for swings subsequent to the first swing.

10.4.1 Monitoring and Recording

As required by Regulation 14(7), each vessel operating as part of the Otway Basin 3D MC MSS will prepare a daily report and carry out a weekly inspection (which will be included within the end-of-week daily report) to ensure that:

- Environmental issues and/or concerns raised through the Management of Change (**MoC**) (**Section 10.4.6**) process are communicated to TGS management and recorded for future learnings;
- Any issues arising from SOPEP testing (**Section 10.10.1**) are reported;
- Monitoring of key parameters (**Table 143**) are recorded for when a review of the approved EP is undertaken, including an evaluation of environment performance based on the potential impacts and risks associated with the Otway Basin 3D MC MSS (i.e. record of emissions and discharges, seismic operation records, waste discharges and estimates of sewerage discharges); and
- The performance of key equipment as described in the approved EP is checked at least weekly to ensure ongoing reduction of risks and impacts to **ALARP** and **Acceptable Levels**, and any potential issues (i.e. observations of poor operating condition/performance or non-conformances) are continually monitored and raised as soon as practicable.

The results will be reported in the end-of-survey EP performance report submitted to NOPSEMA (**Section 10.6.1**).

Table 143 Routine Monitoring Summary[44]

Environment Aspect/Activity	Parameter Measured	Reporting to be Maintained	Responsibility[45]
Physical presence of Seismic Vessel and towed equipment			
Negative interactions with marine fauna due to physical presence of vessels	Adherence to the EPBC Regulations 2000, Part 8, Division 8.1	Induction register Bridge logs. Sighting reports Daily and weekly MFO reports. Daily and weekly PAM reports	Vessel Master MFOs PAM Operator
	Marine fauna ship strike or entanglement incidents	Spatial files of environmental sensitivities Incident report of location, time, type of marine fauna, expected injury. Bridge logs. Daily and weekly MFO reports. Daily and weekly PAM reports DoEE Ship Strike Database.	Vessel Master SEA MFOs PAM Operator
	Adherence to Navigation Act 2012	Bridge logs	Vessel Master

[44] Monitoring of key parameters identified within the OPEP are not considered herein. Instead, these are described in **Section10.10.**

[45] Note that the allocation of responsibilities *specific to the reporting component* of a control measure, may vary from the total suite of personnel responsible for ensuring a given control measure is undertaken. Where additional personnel are cited against a given control and EPS, they have been identified as being required to co-operate and communicate as a component of, or oversee, the execution of the control measure.

Environment Aspect/Activity	Parameter Measured	Reporting to be Maintained	Responsibility[45]
Interactions with other marine users	Communications relating to concurrent at-sea activities	Consultation log 48-hour look-ahead's Notice to Mariners	TGS VOM
	Incident or near miss involving the Seismic Vessel and other marine users	Bridge logs Incident report of location, time, and description of near miss. Report provided to AMSA on any incidents/near misses that threaten the safety of the Seismic Vessel and/or requires remedial action by the Support Vessel. Vessel track records	TGS VOM
Acoustic disturbance to the marine environment			
Impacts to marine fauna through acoustic disturbance	Adherence to Policy Statement 2.1	Compliance and sighting reports as per Policy Statement 2.1 Part A.4 Daily and weekly MFO reports. Daily and weekly PAM reports Whale Observation Report Bridge logs.	MFOs SEA PAM Operator Vessel Master
	Crew training	Induction records/register Audit records	CSR
	Application of Marine Fauna Mitigation Plan	Daily and weekly MFO reports	MFOs
	Spatial and temporal restrictions on acoustic release	Shape files of environmental sensitivities, AA and OA are up to date and accessible Bridge logs Daily and weekly MFO reports digital record of vessel movements, such as via AIS.	CSR Vessel Master MFOs
	Survey restrictions including maximum acoustic source size and acquisition area per year	Bridge logs.	SEA Vessel Master
Routine permissible waste discharges			
Liquid waste discharges	Adherence to MARPOL	Bridge logs Engineers log Maintenance logs confirm equipment/machinery functioned correctly.	Vessel Master Chief Engineer
Oily water discharges	The volume of oily water discharge from the seismic vessel.	Oil usage management electronic records	Vessel Master
Food waste	The volume of food-scraps discharged from the seismic vessel	Waste management electronic records	Vessel Master

Environment Aspect/Activity	Parameter Measured	Reporting to be Maintained	Responsibility[45]
Sewage/grey water discharge	The volume of sewage and grey water discharged from the seismic vessel	Engineers log	Vessel Master Chief Engineer
Atmospheric emissions			
Refuelling	MDO volume	Bridge logs will record the day of bunkering and provide sufficient detail to confirm the bunker note. Bunker note Fuel data sheet Refuelling checklist is completed	Vessel Master
Minimisation of atmospheric emissions	MDO usage	Bunkering records	Vessel Master Seismic Contractor VOC
No deliberate discharge of ODS	ODS discharges	ODS Record Book confirms no deliberate discharge of ODS.	SEA
Incineration of approved substances	Substances incinerated	Incineration Log confirms only wastes approved by the Garbage Management Plan is incinerated and at a distance greater than 12 NM from shore.	SEA
Artificial light emissions			
Light generation from Seismic Vessel	Directional lighting and minimisation of unnecessary lighting	Pre-mobilisation audit records Induction records/register Bridge logs	Vessel Master CSR
	Separation distances from shore maintained	Bridge logs Digital records, such as vessel track records and AIS tracking, showing separation distance of at least 3 NM from shore maintained.	Vessel Master
Invasive marine species			
Introduction of invasive marine species	Ballast water exchange	Pre-mobilisation audit records Ballast Water Logbook detailing all ballast water exchanges, in accordance with Ballast Water Management Plan. Ballast Water Record System	Vessel Master Seismic Contractor VOC
	Vessel hull biofouling	Biofouling Risk Assessment Report. Biofouling Record Book. Incident record form for any sighting or suspicion of any IMS on vessel(s), in niche areas, and in ports/harbours.	Seismic Contractor VOC SEA

Environment Aspect/Activity	Parameter Measured	Reporting to be Maintained	Responsibility[45]
Streamer Loss			
Physical damage to benthic environment from physical impact/loss of streamer	Utilisation of solid streamers, integration of self-recovery devices and recording real-time positioning of the streamers	Incident report/record shows the loss of the streamer and if the equipment is successfully retrieved.	Seismic Contractor VOC Vessel Master
	Location, equipment type, duration of incident and response option taken	Incident report outlining details of equipment loss.	Seismic Contractor VOC Vessel Master
Vessel Collision and Associated Hydrocarbon Spill			
Vessel collision	Location, volume, duration, type of spill and response option taken	Incident report outlining details of incident. AMSA Report Notification. NOPSEMA Reports. POLREP.	Vessel Master
	Communications with relevant persons	Consultation log Notice to Mariners Daily look-aheads	TGS VOM
	Survey restrictions including temporal and spatial restrictions	Shape files of environmental sensitivities, AA and OA are up to date and accessible Bridge logs	SEA Vessel Master
Vessel refuelling	Refuelling operations	Bridge logs will record the day of bunkering and provide sufficient detail to confirm the bunker note. Bunker note Fuel data sheet Refuelling checklist is completed	Vessel Master TGS VOM
	Survey restrictions including temporal and spatial restrictions	Shape files of environmental sensitivities, AA and OA are up to date and accessible Bridge logs	SEA Vessel Master
Hydrocarbon Spill Response			
Secondary impacts from response options	Implementation of response options	Vessel incident report outlining ‘first-strike’ response options undertaken. NEBA Report.	Vessel Master Onshore EA
Accidental Release of Hazardous and Non-Hazardous Materials			
Hazardous and non-hazardous solid waste management	Solid waste generation	Garbage Record Book Safety Data Sheets Waste Transfer Certificate issued by licensed facility of carrier for onshore transfers.	Vessel Master

Environment Aspect/Activity	Parameter Measured	Reporting to be Maintained	Responsibility[45]
Accidental release of hazardous and/or non-hazardous material	Location, volume, and duration of incident, and response option taken	Vessel incident report detailing the release. Notice to Mariners lodged for objects unable to be found/retrieved.	Seismic Contractor VOC Vessel Master

10.4.2 Record Management

The collection of records against the project-specific measurement criteria will form part of the permanent record of compliance maintained by TGS.

As required by Regulations 27 and 28 of the Environment Regulations, TGS will maintain all documents and reports relevant to the Otway Basin 3D MC MSS for a minimum of five years following the completion of the survey. Records will be made available upon request. Documents and reports to be kept by TGS are summarised in **Table 144.**

Table 144 Records Obtained or Utilised in Fulfilment of the Otway Basin 3D MC MSS to be Maintained by TGS

Environmental Management Aspect	Record to be maintained
General	The Otway Basin 3D MC MSS EP and associated documents, including any reviews or revisions
	Vessel certification
	Pre-mobilisation checklist
	Training and awareness and induction materials
	Training, competency, and awareness checklist
	Environmental induction records/register
	All Contractors HSE Plans
	Audit records
	Relevant persons consultation documentation and logs, complaints register
	48-hour look-aheads
	Notice to Mariners
	SIMOPS Plan (where required)
	Bridge logs
	Vessel track records
	Records of emergency/oil spill response exercise
	Records of reportable and recordable incidents and written incident notifications and investigation record
	NEBA Report (where required)
	EP Change Register

Environmental Management Aspect	Record to be maintained
	Environmental Performance Report
	Environmental Compliance Register
	Annual Report
	End-of-survey EP performance report
	End of survey closeout report
Marine Fauna Mitigations	CVs of MFOs and PAM Operators
	Marine Fauna Mitigation Plan
	Marine fauna sighting reports
	MFO daily and weekly logs
	PAM daily and weekly logs
Routine permissible discharges	Discharge logs
	Incineration logs
	ISPP certificate
	IOPP certificate
	IAPP certificate
	Maintenance logs
Atmospheric emissions	ODS Record Book
	Ship Energy Efficiency Management Plan
Invasive marine species management	Ballast Water Management Certificate
	Ballast Water Management Plan
	Ballast Water Record System
	Ballast Water Logbook
	Biosecurity Status Document
	Biosecurity Clearance document
	International Anti fouling certificate
	Biofouling Risk Assessment Report
	Biofouling Record Book
Oil usage management	Fuel Data Sheets
	Bunker notes
	Oil usage records
	Refuelling checklist
Hazardous and non-hazardous materials management	Garbage Management Plan
	Garbage Record Book
	Waste Transfer Certificate (where required)
	SDSs for any hazardous chemicals onboard

All records will be stored in a way that makes their retrieval for reference practicable. In accordance with regulation 28(2), TGS will make available any copies of records mentioned above, following a request in writing by:

- NOPSEMA;
- A delegate of the responsible Commonwealth Minister; and
- A greenhouse gas project inspector or a petroleum project inspector.

The copies of the records will be made available:

- In the case of an emergency relating to an activity – as soon as possible at any time of the day or night during the emergency; and
- In any other case – during normal business hours in the place where the records are kept.

Copies of records will be made available at the place where the records are kept, or if agreed between TGS and the person making the request (or the person's agent), at any other place (including by means of electronic transmission to the person or agent at that place). If the records are stored on a computer, the records will be made available in print-out form or, if TGS and the Regulator so agree, in electronic form.

10.4.3 Compliance Audits, Reviews and Inspections

TGS will undertake compliance audits and reviews consistent with TGS' Audit and Review Process Procedure (HSE-SEP-024). In addition, an ECR will document all EPSs and EPOs and will serve as an auditing tool for compliance monitoring and include a pre-mobilisation checklist. The ECR will document the following:

- The EPOs, EPSs and Measurement Criteria relevant to the Otway Basin 3D MC MSS as set out in the EP;
- The person/party responsible for implementing the performance standard to meet the EPO;
- Whether there is evidence the Otway Basin 3D MC MSS has complied with the relevant EPSs; and
- A brief description of this evaluation based on supporting information such as routine monitoring records, audit records, checklists, and certificates.

The ECR will be updated to reflect new obligations as, and when, they emerge, in accordance with the Management of Change process (**Section 10.4.6**).

TGS will undertake audits at planned intervals and if a 'sub-audit' is triggered (see **Table 145**). These audits are principally intended to support early detection of any non-compliances.

Prior to the commencement of the Otway Basin 3D MC MSS, the survey vessels and equipment will be subject to a pre-mobilisation audit and inspection, to ensure that they are fit for purpose, appropriately maintained, and to ensure compliance with the control measures outlined in the EP. The pre-mobilisation audit will comprise the following processes:

- A pre-mobilisation audit addressing pre-survey planning, preparedness for compliance with regulatory requirements, requirements defined within the EP (including the implementation strategy), operational considerations, and on-board preparedness. This audit will incorporate the training and awareness activities, responsibilities of those onboard the vessel, and environmental induction. Any corrective actions required will be implemented and recorded;
- An audit of the on-board spill response capability against the vessel SOPEP to verify spill preparedness; and

- A pre-mobilisation inspection of all vessels involved with the Otway Basin 3D MC MSS to ensure they are all compliant with the commitments that have been stipulated within the EP.

TGS will conduct a weekly HSE inspection and, using the ECR will include an assessment of compliance with the EPSs, will conduct a mid-survey audit. In both cases, these will assess whether:

- Compliance with the requirements detailed in this EP is being achieved;
- EPOs and EPSs are being monitored, measured and evaluated to ensure impacts and risks remain **ALARP** and at **Acceptable Levels**;
- Emissions and discharges are being monitored, measured and documented as required; and
- Management strategies, procedures, workflows and tools outlined within the implementation strategy are in place and being implemented effectively.

A post campaign review will be undertaken upon completion of seismic activities to review compliance against relevant EPOs and EPSs, using the ECR, and the requirements of the EP.

Throughout the duration of the Otway Basin 3D MC MSS, smaller 'sub-audits' of the contents of the EP will be carried out, as appropriate. Sub-audits will focus on the particular sections of the EP relating to the sub-audit 'trigger' and will include ensuring the EPOs, EPSs and the measurement criteria are being implemented and reviewed to keep impacts and risks to **ALARP** and **Acceptable Levels**. The triggers for a sub-audit and the relevant sections of the EP that will be the target of each sub-audit are provided in **Table 145**, and are summarised below:

- If a marine fauna instigated shut-down occurs[46]
- An adaptive management measure is implemented;
- A reportable incident occurs;
- A recordable incident occurs or non-conformance is identified;
- There is a suspected IMS incursion identified;
- An unplanned event, as identified throughout **Section 8** occurs**;**
- A person/group/organisation contacts or approaches TGS who has not previously been identified or considered as a relevant person (e.g. are self-identified or have been nominally identified by another relevant person);
- Any requirements for revision of the EP are triggered (**Section 10.4.5**);
- The MoC process is triggered (**Section 10.4.6**); and
- As directed by NOPSEMA.

[46] Given the relative frequency with which these may occur, a maximum of one sub-audit per week will occur in response to a marine fauna instigated shut-down

Table 145 Relevant Sections to be Audited during Sub-Audits

Sub-Audit	Relevant sections within EP to be audited
Occurrence of a marine fauna instigated shut-downs.	**Section 7.2, Table 84,** and **Table 87**. Provisions within **Section 10** pertaining to impact and risk management for marine fauna.
Adaptive management measure is implemented.	**Section 7.2, Table 84,** and **Table 87**. Provisions within **Section 10** pertaining to impact and risk management for marine fauna.
Occurrence of a reportable incident.	Relevant sections within **Section 7** and **Section 8** pertaining to the nature of the reportable incident. Control measures, EPSs, and EPOs are to be audited as appropriate. **Section 10**.
Occurrence of a recordable incident or identification of a non-conformance.	Relevant sections within **Section 7** and **Section 8** pertaining to the nature of the non-conformance. Control measures, EPSs, and EPOs are to be audited as appropriate. **Section 10**.
Identification of a suspected IMS incursion.	Section **8.1**, **Table 107** and **Table 109.**
Occurrence of an unplanned event.	Sections **8.1** to **8.5** and associated control measures, EPSs, and EPOs, as relevant to the nature of the unplanned event. **Section 10**.
Identification of a person/group/organisation who has not previously been identified or considered as a relevant person.	Search for new/unidentified relevant persons to be conducted as per the methodology provided within **Section 5**. Relevance of the newly identified relevant person and their claims to be assessed against the requirements provided within **Section 5** and consultation register to be updated as appropriate. Audit to be completed on relevant activities, control measures, EPSs, and EPOs pertaining to the claim made by newly identified relevant persons.
Any requirements for revision of the EP are triggered.	Sections within EP as appropriate to the required revision. Provisions within **Section 10**.
The MoC process is triggered.	Sections within EP as appropriate. Provisions within **Section 10**.
As directed by NOPSEMA.	All sections, control measures, EPSs, and EPOs, as relevant to the nature of the NOPSEMA request.

Non-compliance identified through this auditing process will follow the management of non-conformance process outlined within **Section 10.4.5**. Findings and recommendations obtained through the auditing process will be distributed to the relevant parties in order to undertake the appropriate actions.

Lessons learnt from the environmental compliance audit will be included in the Environmental Performance Report submitted to NOPSEMA (**Section 10.6.1**).

10.4.4 Management of Non-Conformances

Non-conformances and opportunities for improvement may be identified by any crew member during routine observations, during monitoring, an inspection or audit, or as a consequence of an unplanned activity. Crew are required to report any non-conformance they identify.

Any non-conformance with an EPO, EPS that is defined within this EP will be considered as an (recordable) environmental incident (**Section 10.6.3.2**).

Following identification of a non-conformance, remedial actions will be required in order to resolve the issue and to prevent recurrence. All relevant persons will be notified, and follow-up actions will be communicated to all relevant crew and affected parties. Any corrective actions will be tracked and monitored to completion in the ECR.

An internal risk assessment will be undertaken in response to any non-conformances identified, to determine whether any changes are required to operational procedures to ensure any impacts and risks are maintained or reduced to **ALARP** and **Acceptable Levels**. Investigations will include the Party Chief, Vessel Master, SEA, Seismic Contractor VOC and Onshore EA. Any corrective actions required as a result of the non-conformance, will be commensurate with the magnitude of the resulting impacts and risks. Should a change be identified during this risk assessment process, the MoC process will be affected as detailed in **Section 10.4.5**.

All non-conformances/incidents and remedial actions taken will be recorded by the Onboard TGS QC and QHSE Representative, entered into the ECR, and included in the Post-Survey Review Report (**Section 10.6.1**). Continuous improvement and prevention of further non-conformances will be achieved by communicating the identification and management of non-conformances during weekly Safety Meetings and daily Toolbox Meetings, as outlined in **Section 10.2.1**.

TGS will carry forward non-conformances identified during the Otway Basin 3D MC MSS for consideration in future seismic surveys to assist with continuous improvement in environmental management controls and performance outcomes.

10.4.5 Environment Plan Revision and Improvement

TGS will continuously look for ways to improve operations during the Otway Basin 3D MC MSS. Regulation 17 of the Environment Regulations requires the resubmission of the EP to NOPSEMA in the event of a change or proposed change to circumstances or operations. The following criteria will trigger this requirement:

- Any significant modification or new stage of the Otway Basin 3D MC MSS that is not provided for in the EP currently in force;
- The occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk that is not provided for in the EP;
- The occurrence of a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, which, taken together, amount to the occurrence of a significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk that is not provided for in the EP;
- Identification of recent scientific publications that may have an influence on the risk assessment and increase the environmental risk of the Otway Basin 3D MC MSS;

- Identification of any changes to the biological (including the presence of threatened species not already considered under the EP), physical, and socio-economic environment which may have an influence on the risk assessment and increase the environmental risk of the survey;
- The existing suite of control measures are no longer considered suitable to reduce the environmental risk of the survey to **ALARP** and **Acceptable Levels**;
- During operations the number of sightings and/or power-downs of whales are higher than anticipated (i.e three or more shut-downs in the preceding 48 hours for BW/PBW or SRW, or three or more within the preceding 24-hours for 'other whales) during the planning of the Otway Basin 3D MC MSS; and/or
- As requested by NOPSEMA.

In the event of an incident or non-compliance, TGS will review and audit the EP and implemented control measures to identify any potential shortfalls which may exist, any additional mitigation/control measures that could be implemented to prevent such an occurrence from arising again, and to further investigate the cause of the non-compliance.

10.4.6 Management of Change

The MoC procedure outlined in this EP, and which will be implemented for the Otway Basin 3D MC MSS, is consistent with TGS' Management of Change Procedure (HSE-SOP-025). The purpose of Management of Change Procedure is to identify situations in which the MoC process should be used and to describe how the process is conducted, implemented, and closed out.

Overall, the Management of Change procedure applies to any changes to the methods, personnel, facilities, or equipment which may invalidate any control document, including this EP. Other control documents include the HSE-MS, Project HSE Plans, Contracts with Clients and Contractors. The MoC process is invoked to ensure that changes are beneficial and safe. The MoC procedure is utilised when there is a change to the proposed activity, or in the circumstances under which it is being undertaken, which may have the potential to increase or change the level of impact or risk of the Otway Basin 3D MC MSS that is not currently detailed within an accepted EP. MoC is a transparent process used for the identification, assessment, control and documentation of any such change. This process ensures that changes to TGS, personnel, systems and procedures, and equipment are identified and managed so that HSE and environmental risks arising from the change remain **ALARP** and at an **Acceptable Level**. Not all changes require a MoC review, and each change will be assessed on a case-by-case basis.

All MoC is documented using the Management if Change Record Form (HSE-FRM-025-A1). Once completed, this form must be appended to the EP, within an EP Addendum.

10.4.6.1 Triggers for Management of Change

Three regulations under the Environment Regulations require changes to be assessed and managed; these include:

- Regulation 7 – Operations must comply with the accepted EP. This requires that titleholders do not undertake an activity in a way that is contrary to the EP that is in force for that activity. This means that any changes to the Otway Basin 3D MC MSS, or the conditions under which it is being enacted, must be assessed for potential divergence from the accepted EP and possible increase in the environmental impact or risk profile;

- Regulation 8 – Operations must not continue if new or increased environmental risk is identified. This makes it an offence for the titleholder to undertake an activity after the occurrence of any significant new environmental impact or risk arising from the Otway Basin 3D MC MSS; or any significant increase in an existing environmental impact or risk arising from the Otway Basin 3D MC MSS; and the new impact or risk, or increase in the impact or risk, is not provided for in the EP in force for the Otway Basin 3D MC MSS; and
- Regulation 17 – Revision because of a change, or proposed change, of circumstances or operations. This requires a titleholder to submit a proposed revision of the EP for an activity to the Regulator, before the commencement of a new activity, any significant modification or new stage of the activity not provided for in the EP currently in force, including:
- The occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, not provided for in the EP in force;
- Changes in knowledge of environmental impacts, environmental risks or legislative requirements that may arise from (but not limited to) new or revised publications regarding matters of national environmental significance, new knowledge about the existing environment or the effects of the titleholder's activity, information provided by stakeholders, changes in legislation; or
- The occurrence of a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, which, taken together, amount to the occurrence of a significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk, that is not provided for in the approved EP for the Otway Basin 3D MC MSS.

Additionally, change is to be managed in accordance with the Environment Alert issued by NOPSEMA on 30 March 2016. This alert was a result of NOPSEMA inspections which found that titleholders managed change through partial or simplistic environmental assessments which differ to the assessments undertaken during the EP process. A request was made as part of this alert for better consideration of changes and a more robust procedure that is in accordance with the procedures for impact and risk assessment within an accepted EP, to confirm that these impacts and risks are ALARP and at an Acceptable Level throughout the life of the EP

The 2016 Environment Alert issued by NOPSEMA contained a number of deficiencies that were identified in managing change through the implementation of EPs. Specifically, the following points are relevant to the proposed Otway Basin 3D MC MSS which will be regularly considered under this MoC process prior to, and during, the Otway Basin 3D MC MSS:

- Extending the duration of a Seismic Survey;
- Consideration of a series of increases, or new, impacts and/or risks, arising from changes to the Otway Basin 3D MC MSS over time which additively creates a significant increase in impacts or risk;
- Alteration or removal of an environmental performance standard in the accepted EP, including changes to the wording which may materially degrade or diminish the level of performance;
- Reporting of breaches to environmental performance standards after realising that the standard does not, or cannot, monitor the level of performance set in the EP; and
- Discharges to the marine environment are greater than predicted in the EP.

If any of the following types of changes are identified, the MoC process will be implemented:

- A change in titleholder;

- Identification of new impacts or risks, such as a relevant person raises a new issue or concern prior to, or during, the implementation of the EP;
- There is an increase in impact or risk, such as if the acoustic source volume is required to be increased to improve quality of imagery;
- A new stage of the Otway Basin 3D MC MSS is required, e.g. if a significant extension of timeline is required to complete the acquisition;
- Reduced ability to effectively implement the EP to meet its stated environmental performance standards, such as if an MFO is taken ill and demobilised;
- Any incremental change in the Otway Basin 3D MC MSS increasing the risk of significant impact;
- There is a change to QHSE policies, procedures, and legislation;
- There is a change to personnel and organisational changes; and
- Findings from incident investigations indicate the existing implementation strategy, including associated workflows and tools, do not, or cannot, support the level of performance set in the accepted EP.

External changes will also be monitored for a potential trigger for a MoC process, such as:

- New hazards or risks such as gazetting of a new marine park;
- NOPSEMA website listing of a new third party EP including increased petroleum exploration in the region with potential for increased cumulative risks or simultaneous activities in the area that may impact TGS or be impacted by TGS' activities;
- Legislative changes or government documents, such as changes to management plans, species recovery plans, or conservation advice releases;
- New publications, research, or guidelines; and
- External audits, inspections and investigations.

TGS will undertake monthly reviews of the currency of the list of relevant persons and may initiate MoC if new relevant persons are identified and/or new issues which have potential to increase the risk of interference with their functions, activities or interests are determined. A review of potentially new or previously unidentified relevant persons may also be initiated at any time, in the event that TGS is approached, contacted by, or made aware of a person/group/organisation (via self-identification or identified by other relevant persons) that had not previously been identified as a relevant person for the purpose of this EP. TGS will undertake an assessment of any newly identified person/group/organisation to determine if they have functions, activities or interests relevant to the Otway Basin 3D MC MSS, and assess the merit of their claim as a relevant person as per the methodology provided in **Section 5** of the EP. This review will ensure that the impacts and risks of the Otway Basin 3D MC MSS remain **ALARP** and at an **Acceptable Level**.

Likewise, should any revision of the EP be made, TGS will undertake further consultation with relevant persons to inform them of any changes to the Otway Basin 3D MC MSS that may affect their functions, activities, and interests.

Monitoring for potential external triggers of change will be conducted via subscriptions to relevant government websites, journals, and advice, as well as through the continuing consultation process.

10.4.6.2 Originator of Management of Change

All personnel involved with the Otway Basin 3D MC MSS, including vessel crew and TGS staff managing the survey, are required to exercise vigilance and identify any potential changes to the Otway Basin 3D MC MSS which have the potential for changing the impact and/or risk profile, or which may cause deviation from the EP.

All personnel in charge of work functions will be required to report any changes within their area of work. For example, the Vessel Master will be required to report changes to the functionality of pollution control equipment on the vessel as they become aware of such changes. Potential MoC triggers shall be reported immediately to the SEA and CSR.

Responsibilities for reporting MoC triggers will be reinforced to all personnel during the environmental induction process.

10.4.6.3 Management of Change Process

If potential changes to the Otway Basin 3D MC MSS activity are identified which trigger a MoC as identified above, the following steps will be initiated and documented:

- If the trigger identified impacts the current work activity, stop the activity that is impacted;
- Establish a risk assessment team and advise the CSR and SEA;
- Alert the risk assessment team (**Section 10.4.5**);
- Assess the need for TGS to implement a MoC;
- Initiate a risk and impact assessment by Onshore EA, using the same procedures as outlined in **Section 6** of this EP. This process will determine if the increase in risk is significant and would therefore trigger a requirement to revise and resubmit the EP under Regulation 17 of the Environment Regulations. The EP change register will document the assessment timing and its findings and summarise any changes to the EP which are required to manage risks and impacts to **ALARP** and to an **Acceptable Level**;
- If resubmission of the EP is required, the work or the new activity is to be suspended until the revised EP is accepted by NOPSEMA;
- Evaluate the level of HSE risk resulting from the change, in accordance with TGS' Standard Operating Procedure for Risk Management (HSE-SOP-010) to determine the impact on existing critical safety items and devices, or requirements for new ones, on existing documentation, training requirements and identify any special precautions required to maintain safe operations during implementation of the change;
- Develop any additional controls required to reduce risks and impacts to **ALARP** and to an **Acceptable Level**;
- Assign responsibilities for any additional or amended controls, EPSs and measurement criteria required;
- Additional or amended controls, EPSs and measurement criteria will only be applied where the risk and impact assessment determine they demonstrably enhance or improve performance;
- Further consultation with relevant persons will occur if any changes may affect their activities/interests or the risk profile of their activity. Further consultation will give consideration to previous feedback discussed throughout **Section 5** and **Appendix K**;
- Document that Management of Change process using the Management of Change Record Form (HSE-FRM-025-A1);

- Develop an EP Addendum which documents the following:
- The MoC process followed;
- The risk and impact assessment process undertaken;
- Rationale for conclusions on residual risk;
- Relevant person consultation and any feedback received;
- Details on any additional controls to be implemented to manage the impacts and risks;
- Demonstration of **ALARP** and justification for acceptability;
- Revised EPSs, measurement criteria, control measures and any associated revisions to the responsibilities for each;
- Details on how the implementation of the change was managed, including through communication and to ensure training, competency and awareness;
- Confirmation that all sections of EP have been checked to ensure any potential deviations from the accepted plan have been captured and addressed; and
- Append the Management of Change Record to the EP Addendum

10.4.6.4 Approver of Management of Change Outcomes

If a resubmission and approval from NOPSEMA is not required under Regulation 17 resubmission (and hence approval from NOPSEMA), any work on new or modified activities will only commence on the authority of the TGS VOM.

10.5 Support Vessel Operations

At least one Support Vessel (i.e., support, chase, or supply vessel) will be present in close proximity to the Seismic Vessel for the duration of the Otway Basin 3D MC MSS; this vessel is referred to as the Attending Support Vessel in this EP. The primary role of the Support Vessel is to manage any possible interactions between the Seismic Vessel and the seismic array (i.e. acoustic source and streamer) with any other vessels or maritime activities occurring in the area. The Support Vessel/s will assist with informing any other vessels in the path of the approaching Seismic Vessel that cannot be raised on VHF radio or any other means. In addition, the Attending Support Vessel will also be utilised as an additional platform for MFOs. The Attending Support Vessel will have two dedicated and trained MFOs onboard to support the MFO efforts from the Seismic Vessel.

While the presence of the Support Vessel/s in the OA does pose additional risk to marine mammals in the area, the Vessel Master of these vessels will be operating in accordance with the EPBC Regulations Part 8, Division 8.1 in regards to the minimum approach distances and vessel speed for “other craft” and follow the prescribed actions when adult cetaceans and/or calves are present within the caution zone (defined by these regulations as a 150 m radius around a dolphin, and 300 m radius around a whale).

The following procedures will be implemented onboard the Support Vessel/s:

Communications:

- The Support Vessel/s will be in close contact with the Seismic Vessel on VHF radio at all times to ensure clear communications are maintained;

- The Support Vessel/s will be able to receive and transmit communications via VHF radio at all times with all maritime traffic in the area; and
- The MFOs on the Support Vessel/s will maintain direct communication with the MFOs and PAM Operators onboard the Seismic Vessel at all times throughout their observational shift.

Maintenance of distance to Seismic Vessel:

- The Support Vessel/s will be present around the Seismic Vessel at all times unless an intervention with another marine user is necessary;
- In the case that the Support Vessel/s is unable to maintain such a presence (e.g. it is undertaking intervention actions), the Masters of the survey vessels will maintain radio contact;
- The Attending Support Vessel will have an MFO on watch during daylight hours observing for marine mammals;
- The Support Vessel will travel as far as practicable ahead of the Seismic Vessel (Defined as an 180° arc ahead of the Seismic Vessel) and will conduct visual surveillance for marine mammals during daylight hours; and
- The Support Vessel/s will be equipped with radar, ARPA and AIS, allowing the exact position and distance between the survey vessels to be continuously monitored.

Use of the Attending Support Vessel as a secondary observational platform for marine mammals:

- Two trained and experienced MFOs will be on the Attending Support Vessel to provide additional visual observational capabilities for the duration of the Otway Basin 3D MC MSS;
- The on-duty MFO will be stationed on the bridge of the Attending Support Vessel during daylight hours to assist the Seismic Vessel detect marine mammals;
- If the MFOs on the Attending Support Vessel observe a marine mammal, the lead MFO on the Seismic Vessel will be notified immediately;
- The MFOs on the Attending Support Vessel will have the same roles and responsibilities as those on the Seismic Vessel, including the full authority to direct control measures such as shut-down of the acoustic source if a whale is observed within a relevant Shut-down Zone; and
- After the Seismic Vessel has been notified by the Attending Support Vessel of a shut-down/power-down requirement, the appropriate control measure will be implemented immediately by the Seismic Vessel (including any required adaptive management procedure, see **Section 7.2.2.3.6**).

10.6 Reporting

The Environment Regulations requires a number of notifications for starting and ending an activity, and ending of an EP. TGS will comply with these notification requirements, as per the below:

- Start of Activity Notification – At least 10 days before the commencement of the Otway Basin 3D MC MSS, TGS must provide written notification to NOPSEMA of the date of intention to commence the activities approved under the EP;
- End of Activity Notification - At least 10 days following the completion of the Otway Basin 3D MC MSS, TGS must provide written notification to NOPSEMA of the date of the completion of the activities approved under the EP; and

- End of EP Notification – As soon as practicable on the completion of the last activity covered under the survey, TGS must provide written notification to NOPSEMA informing that all of the activities and obligations covered under the EP have been completed. Following acceptance of the notification by NOPSEMA, the EP is no longer in force.

Further pre-survey and post-survey notifications will also be provided to the relevant persons outlined within **Sections 5.5.10** and **5.5.14**.

10.6.1 Environmental Performance Reporting

Under Regulation 14(2) of the Environment Regulations, TGS are required to '*report to the Regulator in relation to the titleholder's environmental performance of the activity, and provide that the interval between reports will not be more than one year'*. Accordingly, TGS will maintain a record of the environmental performance of the Otway Basin 3D MC MSS in relation to the EPOs, EPSs, measurement criteria and implementation strategy. This record will be documented in the form of an ECR.

A detailed report on the environmental performance ('Environmental Performance Report'), including the ECR, will be submitted to NOPSEMA for assessment within two months of survey completion or annually from the date of EP acceptance, whichever occurs first. The report and associated ECR will be retained by TGS for a period of five years and will be made available as stated in **Section 10.4.2.**

Regulation 26(c) requires submission of a report to the regulator '*in relation to the titleholder's environmental performance for the activity, at intervals provided for in the EP'*. The Annual Report will be submitted to satisfy this requirement.

The Post-Survey Review Report/Annual Report will include the following:

- A review of routine activities and incident records, including:
- Whale sighting records, and any other interactions with whales requiring start-up delays;
- Records of any interaction between marine fauna and vessels of towed equipment used during the survey; and
- Records of any unplanned activities, such as accidental discharges of hazardous and non-hazardous substances, vessel collisions or negative interactions with commercial operators in the Otway Basin (fishing, shipping etc.);
- An assessment of compliance with requirements set out in the EP (i.e. compliance with the EPOs and EPSs);
- An assessment of compliance with the TGS HSE MS; and
- A review of all recordable and reportable incidents.

10.6.2 Marine Fauna Reporting

As required by Policy Statement 2.1, a report on all whale interactions will be provided to the DoCCEEW within two months of survey completion. In addition, given the other sensitivities in the area, this report will also include any interactions with other marine fauna such as marine turtles, pinnipeds, and aggregations of southern bluefin tuna. The report will contain the following information as a minimum:

- The location, date and start time of the survey;
- Name, qualifications and experience of any MFOs (or research scientists) involved in the survey;

- The location, times and reasons when observations were hampered by poor visibility or high winds;
- The location and time of any start-up delays, shut-downs or stop work procedures instigated as a result of whale or turtle sightings;
- The location, time and distance of any whale, pinniped, marine turtle and southern bluefin tuna aggregation sighting including species, where possible;
- Details of any incidents (reportable and recordable) and non-conformances; and
- The date and time of survey completion.

The following additional information may also be collected for all marine mammals, during the Otway Basin 3D MC MSS:

- The location, time and distance of any marine mammal sighting including species where possible;
- Method of detection (visual or PAM);
- Observation platform;
- Water depth at time of each whale sighting;
- Sea condition (Beaufort scale) at time of each marine mammal sighting;
- Number of animals involved in each marine mammal sighting (total);
- Number of juveniles involved in each marine mammal sighting (if present);
- Description of behaviour for each marine mammal sighting;
- Description of any injuries, mortality, entanglement or other interactions;
- Distance from acoustic source at first sighting;
- Closest subsequent distance to acoustic source;
- Behaviour at first sighting (travelling, feeding, milling etc.); and
- Subsequent behaviours (avoidance, attraction and other changes in behaviour).

Cetacean sightings will be recorded using the 'Cetacean Sightings Application' software as outlined in Policy Statement 2.1. Upon completion of the survey the information entered into this application will be exported as a text file and emailed to sightingsdata@aad.gov.au.

10.6.3 Reportable and Recordable Incident Reporting

10.6.3.1 Reportable Incidents

Regulation 26 of the Environment Regulations requires TGS to report all 'reportable incidents' that occur in relation to the Otway Basin 3D MC MSS. Under the Environment Regulations, a reportable incident is defined as '*an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage*'.

For the purpose of the Otway Basin 3D MC MSS, reportable incidents have been identified as:

- Confirmed introduction of IMS;
- Any incident involving a collision between the survey vessels and marine megafauna;
- Any incident involving the entanglement of megafauna in towed equipment;

- Any incident involving a negative interaction between other marine users (i.e. those identified in the EP) such as a collision or whereby intervention by the Support Vessel is required; and
- Any incident that results in a hydrocarbon spill of > 80 L into the surrounding marine environment.

In line with guidance provided by NOPSEMA (Notification and Reporting of Environmental Incidents Guidance Rev 4 2014), additional environmental incidents that are required to be reported to NOPSEMA, whether or not they have been classified as having the potential to cause '*moderate to significant environmental damage*' includes any impacts to Part 3 Protected Matters under the *Environment Protection and Biodiversity Conservation Act 1999*. Matters under Part 3 of the EPBC Act that are relevant to the proposed activity are:

- National Heritage places;
- Listed Threatened Species and Communities;
- Listed Migratory Species;
- Commonwealth marine areas; and
- Nationally Important Wetlands.

NOPSEMA must be provided with an oral notification (phone 1300 674 472) of any reportable incident as soon as practicable after the reportable incident, and no later than two hours after the first occurrence of the reportable incident, or after first becoming aware of a reportable incident.

Notification of the Reportable Incident must be oral and must include the following:

- All material facts and circumstances concerning the incident that TGS knows, or is able to find out with reasonable effort;
- Actions taken to avoid, or mitigate adverse impacts arising from the reportable incident; and
- Any corrective actions that were taken, or have been proposed to be taken to stop, control, or remedy the reportable incident.

Following oral notification of the reportable incident, a written record of the notification must be provided to the following as soon as practicable, but within seven days of the incident:

- NOPSEMA (via submissions@nopsema.gov.au);
- National Offshore Petroleum Titles Administrator (via resources@nopta.gov.au); and
- Department of the responsible State Minister.

Even though a Level 2 incident/Tier 2 hydrocarbon spill will require involvement from a third-party control and control agency, the overall responsibility for reporting reportable incidents in accordance with the Environment Regulations is with TGS.

10.6.3.2 Recordable Incidents

TGS will maintain a record via an ECR of breaches of an EPOs or EPSs that do not meet the definition of a reportable incident (i.e. a recordable incident). Recordable incidents occurring during the survey that have actual or potential reputational risk to TGS will also be recorded in the ECR. The reputational risk of recordable incidents will be assessed as they apply to TGS' risk assessment and performance standards.

A record detailing the incident must be provided to NOPSEMA as soon as practicable, but not later than 15 days, after the end of the calendar month. If no recordable incidents occur, a monthly 'nil incident' report is required to be submitted to NOPSEMA (via submissions@nopsema.gov.au). The monthly Recordable Incident Report must include the following:

- A record of all recordable incidents that occurred during the previous calendar month, including date of each incident;
- All material facts and circumstances concerning the incident that TGS knows, or is able to find out with reasonable effort;
- The EPS and/or EPO breached;
- Actions taken to avoid, or mitigate any adverse impacts arising from the recordable incident;
- Any corrective actions that were taken, or have been proposed to be taken to stop, control, or remedy the recordable incident; and
- Any actions that were taken, or have been proposed to be taken, to avoid a similar incident occurring in the future.

If the non-conformance is identified to be the result of a deficient performance standard which does not, or cannot, monitor the level of performance set in the EP, the MoC process and reporting will be affected as detailed in **Section 10.4.5**.

The Annual report will include a summary of all recordable incidents that occurred during the Otway Basin 3D MC MSS. Any lessons learnt during such an incident and the subsequent compliance audit, will be included in the Annual Report as well.

10.6.3.3 TGS Incident Reporting

Incidents involving people, environment, and property (including reportable and recordable incidents) during the survey will be recorded, reported and investigated to ensure continual improvement throughout the Otway Basin 3D MC MSS and future surveys is maintained. TGS will report incidents according to the requirements outlined in TGS' Incident Report and Investigation Procedure (HSE-SOP-012).

All corrective actions arising from incidents, audits and inspections are recorded and monitored until closure. Corrective and preventative actions taken to eliminate the cause of potential incidents will be commensurate with the magnitude of the environmental risks.

In line with TGS' commitment to continual improvement, environmental incidents and near misses will be shared amongst vessels (seismic and support vessels), and corrective actions will be applied to other vessels where relevant. In addition, TGS will carry forward the identified corrective/preventative actions from incidents for consideration in future seismic survey campaigns to ensure "lessons learnt" are captured and assist with continuous improvement in environmental management or to provide frequency data (i.e. likelihood determination) associated with seismic survey operation.

10.6.3.4 Incident Reporting to Other Agencies

In the event of an incident, TGS will provide appropriate reporting to external agencies in accordance with the regulatory requirements and good industry practice and as described within the EP. A summary of identified requirements for external incident reporting, timing, methods (forms) and responsible person are provided in **Table 146**.

Table 146 Summary of External Incident Reporting Requirements and Timing

<table>
<tr><th>Requirement</th><th>Timing</th><th>Contact</th><th>Responsible Person</th></tr>
<tr><td colspan="4">Recordable Incident – as defined in Section 10.6.3.2.</td></tr>
<tr><td>The monthly Recordable Incident Report must include the following:
• A record of all recordable incidents that occurred during the previous calendar month, including date of each incident;
• All material facts and circumstances concerning the incident that TGS knows, or is able to find out with reasonable effort;
• The EPS and/or EPO breached;
• Actions taken to avoid, or mitigate any adverse impacts arising from the recordable incident;
• Any corrective actions that were taken, or have been proposed to be taken to stop, control, or remedy the recordable incident; and
• Any actions that were taken, or have been proposed to be taken, to avoid a similar incident occurring in the future.
If no recordable incidents occur, a monthly ‘nil incident’ report is required.</td><td>Before the 15th day of the following calendar month.</td><td>NOPSEMA:
submissions@nopsema.gov.au</td><td>TGS VOM</td></tr>
<tr><td colspan="4">Reportable Incident – as defined in Section 10.6.3.1.</td></tr>
<tr><td><u>Verbal notification:</u>
Notification of the Reportable Incident must be oral and must include the following:
• All material facts and circumstances concerning the incident that TGS knows, or is able to find out with reasonable effort;
• Actions taken to avoid, or mitigate adverse impacts arising from the reportable incident; and
• Any corrective actions that were taken, or have been proposed to be taken to stop, control, or remedy the reportable incident.</td><td>Within two hours of becoming aware of the incident</td><td>NOPSEMA:
1300 674 472

DEECA (Victoria):
0419 597 010

EPA (Tasmania):
1800 005 171

DIT (South Australia)
08 8248 3505</td><td>TGS VOM</td></tr>
</table>

Requirement	Timing	Contact	Responsible Person
Written notification: Verbal notification of a reportable incident to the regulator must be followed by a written report. As a minimum • All material facts and circumstances concerning the incident that TGS knows, or is able to find out with reasonable effort; • Actions taken to avoid, or mitigate adverse impacts arising from the reportable incident; • Any corrective actions that were taken, or have been proposed to be taken to stop, control, or remedy the reportable incident; and • The action that has been taken or is proposed to be taken to precent a similar incident occurring in the future.	Not later than three days after the first occurrence of the incident.	NOPSEMA: submissions@nopsema.gov.au	TGS VOM
Written incident reports to be submitted to NOPTA and DEECA/EPA (for incidents in Commonwealth waters)	Within seven days of written report submission to NOPSEMA	NOPTA: reporting@nopta.gov.au DEECA (Victoria): ERRChiefInspector@ecodev.vic.gov.au EPA (Tasmania): incidentresponse@epa.tas.gov.au	TGS VOM
Vessel spill to marine environment All discharges/spills or probably discharges/spills to the marine environment of oil or oily mixtures, or noxious liquid substances in the marine environment from vessels.	Verbal notification ASAP	Immediate notification by Vessel Master to AMSA. Follow-up with Marine Pollution Report (POLREP): 1800 641 792 rccaus@amsa.gov.au https://amsa-forms.nogginoca.com/public/	Vessel Master

Requirement	Timing	Contact	Responsible Person
Australian Marine Parks The DNP should be made aware of oil/gas pollution incidences which occur within an AMP or are likely to impact on an AMP. The DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident. Notification should include: • Titleholder details; • Time and location of the incident (including name of Marine Park likely to be affected); • Proposed response arrangements and locations as per the OPEP; • Confirmation of providing access to relevant monitoring and evaluation reports when available; and • Contact details for the response coordinator.	Verbal notification ASAP	Notification should be provided to the 24-hour Marine Compliance Duty Officer on: 0419 293 465	Vessel Master
Vessel strike with cetacean Actual or suspected injury to whales from ship strike	Within 72 hours	Online via the National Ship Strike Database: https://data.marinemammals.gov.au/report/shipstrike	Vessel Master
	ASAP for cetacean injury assistance	Whale and Dolphin Emergency Hotline (Victoria): 1300 136 017 Whale Hotline (Tasmania): 0427 942 537	Vessel Master / SEA
Injury to or death of EPBC Act listed species	Within seven days	DoCCEEW: 02 6274 1111 EPBC.Permits@environment.gov.au	SEA
Suspected or confirmed IMS introduction	Verbal notification ASAP	DEECA (Victoria): 136 186 Marine.pests@agriculture.vic.gov.au Department of Natural Resources and Environment Tasmania: 03 6165 3777 Biosecurity.tasmania@nre.tas.gov.au	SEA

10.7 Regulatory Inspections

Under Part 5 of the OPGGS Act, NOPSEMA inspectors have authority to enter TGS premises, including the survey vessel/s for the purposes of undertaking monitoring or investigations against the EP. TGS will fully cooperate with NOPSEMA during such inspections.

10.8 Emergency Response

A survey specific Emergency Response Procedure (**ERP**) will be included in the Project HSE Plan, in accordance with the requirements of TGS' Emergency Preparedness and Response Procedure (HSE-SOP-401). The ERP contains instructions for medevac, fire/explosion, spill and security events, at a minimum, with further ERPs produced as circumstances dictate and as identified during project planning.

In the event of an emergency of any type, the Vessel(s) Master will assume overall onsite command and act as the Emergency Response Coordinator. All persons aboard the vessel/s will be required to act under the Emergency Response Coordinator's directions. The survey vessel(s) will maintain communications with the TGS VOM and/or other emergency services in the event of an emergency. Emergency response support can be provided by TGS, if requested by the Emergency Response Coordinator.

The survey and support vessels will have equipment onboard for responding to emergencies, including but not limited to medical equipment, firefighting equipment and oil spill equipment.

As part of the pre-mobilisation audit, TGS will initiate emergency response tests as required with the assigned personnel. This will include a desktop-based exercise to confirm on-call emergency response team contact details.

The Vessel Master will conduct a vessel SOPEP and OPEP test via a drill assessment and evaluation with recommendations for future drills. This testing will be undertaken:

- Prior to mobilisation;
- Periodically during the Seismic Survey, at a frequency of every three months;
- When response arrangements are significantly modified, following response exercises; and
- Where required by any action defined in the post-activity report.

10.9 Adverse Weather Procedures

Severe weather events have the potential to cause damage to survey vessels, equipment, risk to the health and safety of survey of personnel and unplanned discharges of hazardous materials into the marine environment.

TGS will ensure that approved vessel contractors have a procedures and controls in place that covers dangerous weather situations. TGS will ensure that the approved vessels adverse weather procedures and controls align with TGS's HSE-MS Policies and Standard Operating Procedures, prior to commencing the Otway Basin 3D MC MSS.

In addition to the severe weather procedures and controls that will be in place, TGS will subscribe to a weather monitoring service that will provide forecasts that update regularly throughout the day. This monitoring service will provide information on wind, waves/seas and currents, primarily to plan the movements and operations to occur when and where in the OA the weather is safest and operationally feasible to acquire the survey safely. The benefit of this service will provide TGS prior warning of any severe weather event forming within, or approaching, the OA.

If sustained severe weather looks to be forming within the region, the vessels may leave the OA for safer waters. Depending on the situation, the survey vessel may also retrieve the seismic equipment and in a worst-case scenario proceed to the nearest port.

10.10 Oil Pollution Emergency Plan

This section sets out the OPEP to be followed in the event of a Type 1 or Type 2 hydrocarbon spill. This is set out in accordance with Regulation 14(8AA)(d) of the OPGGS (E) Regulations (2009).

It is important to note that TGS' response arrangements do not negate the requirements for a SOPEP. Once contracting has been completed with the successful Seismic Vessel, the SOPEP for this vessel will be reviewed, tested, and incorporated into the OPEP arrangements as part of this EP.

This OPEP does not describe spills for petroleum operator infrastructure as the Otway Basin 3D MC MSS will have no interactions with offshore infrastructure, thus is out of scope for this EP.

10.10.1 Vessel Shipboard Oil Pollution Emergency Plan

MARPOL Annex I require a SOPEP to be carried on all vessels greater than 400 gross tonnes. In general, a SOPEP describes the steps to be taken:

- In the event that a hydrocarbon spill has occurred;
- If a vessel is at risk of a hydrocarbon spill occurring, and
- For notification procedures in the event of a hydrocarbon spill occurring and provides all important contact details.

The Vessel Master is the overall in charge of the SOPEP and ensuring that all crew comply with the plan.

Although Support Vessels are not required under MARPOL Annex I to have a SOPEP, TGS will require the Support Vessel, Seismic Vessel and Chase Vessel hold a SOPEP.

Each SOPEP will be specific to the vessel that holds it (i.e. separate SOPEPs will be held by the survey vessels and will contain vessel-specific details). The SOPEP will provide the following:

- A description of all actions to be taken by onboard personnel to reduce or control the discharge following a hydrocarbon spill incident;
- A detailed description of all spill response equipment held onboard the vessel including what equipment is available and its stored location;
- Detailed diagrams of the vessel, including locations of drainage systems, location of spill response equipment, and general layout of the vessel;
- An outline of the roles and responsibilities of all onboard personnel with regard to hydrocarbon spill incidents;

- A description of the procedures and contacts required for the co-ordination of hydrocarbon spill response activities with the relevant National and Local Authorities; and
- Requirements for testing of the SOPEP and associated drills.

The SOPEP also includes specific emergency procedures including steps to control discharges for bunkering spills, hull damage, grounding and stranding, fire and explosions, collisions, tank failure, sinking and vapour release.

In accordance with the control measures that will be implemented during the Otway Basin 3D MC MSS (**Section 8.3.6**) each vessel involved in the Otway Basin 3D MC MSS will have:

- An IMO certified SOPEP;
- A SOPEP drill conducted prior to the Otway Basin 3D MC MSS commencing (i.e. within three months). A SOPEP drill is normally every three months; however, due to the proposed duration of the Otway Basin 3D MC MSS, with this measure in place a SOPEP drill will be performed at least once during the Otway Basin 3D MC MSS;
- The spill kits will be kept fully stocked (to vessel class requirements) and any items will be replaced if they are used; and
- In the event of a hydrocarbon spill, the Vessel Master will implement available controls and resources of the SOPEP.

10.10.2 Statutory Plans

10.10.2.1Commonwealth Waters

If an oil spill occurs within Commonwealth waters the National Plan will apply and integrates with the relevant State response plans (discussed in **Section 10.10.2.2**). Initial actions would be undertaken immediately by the Vessel Master, with any further actions determined following immediate contact with AMSA.

The National Plan integrates the response from both the Commonwealth and relevant State Governments to ensure an effective response to marine pollution incidents. The National Plan provides for AMSA to be the Controlling Authority when responding to a spill event who works closely with the relevant State Governments, emergency services and industry to ensure a robust response capability.

10.10.2.2State Waters

Should a spill occur during the Otway Basin 3D MC MSS which originates within, or is likely to move into, State waters, the relevant statutory plans are as follows (depending on the location and trajectory of the spill):

- The VIC state plan is the Transport Safety Victoria (**TSV**) (transport safety regulator for VIC) Victorian State Emergency Management Plan[47] (**SEMP**). The Maritime Safety Victoria (**MSV**) unit is the Controlling Authority.
- The TAS state plan is the Tasmanian Marine Oil and Chemical Spill Contingency Plan- (**TasPlan**)[48]. The EPA Tasmania (**TAS EPA**) is the Controlling Authority for TAS waters.

[47] https://www.emv.vic.gov.au/index.php/responsibilities/semp#_ga=2.79633948.961878487.1684482621-2142804526.1684482621
[48] https://epa.tas.gov.au/Documents/TasPlan.pdf

- The NSW state plan is the NSW State Waters Marine Oil and Chemical Spill Contingency Plan49, a sub-plan to the NSW State Emergency Management Plan. The NSW Department of Transport (Maritime) (**NSW DoT Maritime**) is the Controlling Authority for NSW state waters.
- The South Australia state plan is the South Australian Marine Spill Contingency Action Plan[50] (**SAMSCAP**). The South Australia Department of Planning, Transport and Infrastructure (**SA DPTI**) is the Controlling Authority for South Australian state waters.

10.10.3 Hydrocarbon Spill Response Framework

TGS utilise the incident classification as outlined in the National Plan (AMSA, 2019) for hydrocarbon spills to provide direction on the potential consequence and impact of the incident and to provide guidance for preparedness, incident notifications and response actions.

Two levels of incident are possible for the Otway Basin 3D MC MSS:

- **Level 1:** Incidents are generally able to be resolved through the application of local or initial resources only (e.g. first-strike capacity); and
- **Level 2:** Incidents are more complex in size, duration, resource management and risk and may require deployment of jurisdiction resources beyond the initial response.

The division of the responsibilities in the event of a hydrocarbon spill that affects State and Commonwealth Waters is provided in **Table 147**.

Table 147 State and Commonwealth Hydrocarbon Spill Responsibilities

Location	Spill Source	Statutory Authority	Controlling Authority	
			Level 1	Level 2
Commonwealth waters	Shipping sourced spill	NOPSEMA	AMSA	AMSA
Victoria state waters		TSV MSV	TSV MSV	TSV MSV
Tasmania state waters		TAS EPA	TAS EPA	TAS EPA
NSW state waters		NSW DoT (Maritime)	NSW DoT	NSW DoT
South Australia state waters		SA DPTI	SA DPTI	SA DPTI

10.10.3.1Controlling Authority

AMSA is the designated Controlling Authority if a hydrocarbon spill occurs from a ship associated with the Otway Basin 3D MC MSS within Commonwealth waters. AMSA will assume control of the incident and respond in accordance with the National Plan. TGS will assume a Support Agency role and provide all available assistance to AMSA during their Controlling Authority responsibilities.

[49] https://www.nsw.gov.au/sites/default/files/2022-07/oil-spill-contingency-plan-nsw-state-waters.pdf
[50] https://cdn.environment.sa.gov.au/environment/docs/sa-marine-spill-cont-action-plan.pdf

10.10.3.2 Cross Jurisdictional Coordination

As stated in the National Plan, maritime environmental emergencies have the potential to impact upon the interests of two or more Australian jurisdictions, where both jurisdictions have legitimate administrative and regulatory interests in the incident. In this case, the National Plan addresses these complexities through the *Guidance on the Coordination of Cross Border Incidents* which provides for the establishment of an incident coordination process and the determination of a 'lead' jurisdiction, if appropriate.

10.10.4 Nature and Scale of Preparedness

10.10.4.1 Maximum Credible Scenario

As described in **Section 8.3** it is considered that either a vessel collision or refuelling at sea are the only credible scenarios in which a hydrocarbon spill could occur during the Otway Basin 3D MC MSS. As the vessel collision, and associated hydrocarbon spill, would result in the greatest impact on the receiving environment, this scenario is considered here. Based on AMSAs "*Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities*" (AMSA, 2015), the largest fuel tank is adopted as the worst-case Maximum Credible Scenario (**MCS**) that may result from a vessel collision. In the absence of vessel specifications, a spill of 1,066 m^3 of MDO from the Seismic Vessel (through vessel collision) is considered to be the MCS. This MCS is very conservative, as it is assumed vessel fuel tanks will be at smaller capacity than 1,066 m^3, fuel will be compartmentalised into separate tanks, and while the survey is underway it is likely that the tank will not be 100% full. In addition, there is a hierarchy of controls in place to avoid this MCS from occurring.

10.10.4.2 Hydrocarbon Characteristics and Behaviour

The fuel to be used during the Otway Basin 3D MC MSS is MDO which is a light petroleum distillate. This would undergo rapid dispersion and evaporation if it was released into the high energy offshore marine environment of the Otway Basin. DNV (2011) estimates that the half-life of MDO is 2.5 hours in wind speeds of 10 m/s, 1 hour at 20 m/s and approximately 12 minutes in storm conditions with wind speeds over 30 m/s.

Based on outcomes of scenario modelling (summarised in **Section 8.3.2**, and **Appendix C**) for the Otway Basin, the MDO will initially be present longer as entrained oil (near the surface), but then undergo rapid partitioning to vapour (i.e. to air), degraded through decay, partition into water (as dissolved and dispersed fractions), with a small fraction expected to be beached. The worst-case scenario (from deterministic modelling), whilst predicting that under calm weather and the most proximate release point to result in up to 11% of a 1,066 m^3 spill to be beached (from a spill at Location 1), is considered highly conservative. It is highly unlikely given the hierarchy of controls in place to prevent this occurrence.

10.10.4.3 Spatial Extent of Maximum Credible Scenario

Hydrocarbon spill modelling has been summarised in **Section 8.3.2** to inform the development of this EP and risk assessments. In the unlikely event that a vessel collision occurs, real-time modelling is also proposed to confirm any assumptions about the EMBA, and level of response required. The extent of the MCS has been based on stochastic modelling using the SIMAP.

Outputs of the scenario modelling were used to define the extent of the EMBA and identification of intersections with potential impacts on sensitive receptors which have the potential to be subjected to surface-oiling (assessed in **Section 4**).

10.10.5 Net Environmental Benefit Assessment / Spill Impact Mitigation Assessment

NEBA and SIMA are commonly used globally for evaluating the potential benefits versus impacts of implementing a pre-defined spill response strategy. The purpose is to identify the most appropriate response strategy(ies) which can be implemented under real-time factors influencing the spill dynamics (location, amount, prevailing weather conditions etc). It can also be a rapid decision-making tool employed by the CA under time constraints.

The following is a summary of steps normally used by the CA to conduct a NEBA/SIMA for a Level 2 spill (summarised from IPICEA, 2017):

1. **Compile and evaluate data** for relevant spill scenarios (oil properties, situational awareness, Oil Spill Trajectory Modelling, environmental sensitivities, identification of resources at risk, and determination of feasible response options);
2. **Predict outcomes/impacts** for the no intervention (or 'natural attenuation'/unmitigated spill impact) option as well as the effectiveness (i.e. relative mitigation potential) of the feasible response options for each scenario;
3. **Balance trade-offs** by weighing and comparing the range of benefits and drawbacks associated with each feasible response option, including no intervention, for each scenario; and
4. **Select the best response option(s)** to form the strategy for each scenario, based on the combination of techniques that will minimize the overall ecological, socio-economic and cultural impacts and promote rapid recovery, and maximise potential for environmental protection.

For any response initiated in Commonwealth Waters, TGS will provide support to the AMSA IMT (CA) for NEBA/SIMA though utilisation of existing TGS personnel, or third-party Subject Matter Experts where appropriate. For State waters (either VIC, TAS, NSW, South Australia) TGS will also provide support. Oil spill response and planning tools listed on the AMSA and relevant state plan websites will be used throughout the planning and response process.

10.10.6 Hydrocarbon Spill Response Arrangements

10.10.6.1 Hydrocarbon Spill Resources

TGS will ensure that the vessels used for the Otway Basin 3D MC MSS will have on-site response equipment for the prevention and minimisation of loss of oil to the sea. This equipment will include the on-board spill containment and recovery kits which includes absorbent material to meet the flag state and class requirements. All crew onboard will be trained in the use of this spill response equipment and know the location of the response kits. However, this response equipment that will be onboard will not be suitable for deployment to sea for any spills.

For Level 2 spills, the equipment needed (such as booms – although this is not likely needed for MDO) will come from AMSA stockpiles (either from the Melbourne (VIC), Devonport (TAS), Sydney (NSW), and/or Adelaide (South Australia) stockpile dependant on location of the spill) deployed through the National Plan arrangements. AMSA also has access to stockpiles in other states which are managed by the Australian Marine Oil Spill Centre.

10.10.6.2Spill Response Options

An assessment of the hydrocarbon spill response options was undertaken within **Section 8.4**. These options include:

- Source control including securing cargo and trimming;
- Natural weathering relating to monitoring and evaluating the spill via vessel/aerial surveillance and trajectory modelling;
- Physical break-up via vessel prop-washing;
- Application of dispersants;
- Containment and recovery through booms and skimmers;
- Protection and deflection utilising booms in the intertidal area;
- Shoreline clean-up through physical removal, surf washing, flushing and natural dispersion; and
- Oiled wildlife response via capture and rehabilitation.

This assessment concluded that source control and natural weathering are the preferred options when dealing with a hydrocarbon spill during the Otway Basin 3D MC MSS due to the location of the OA and the likely break-up of MDO.

Source control will be undertaken as part of a Level 1 response in accordance with the vessels SOPEP. For Level 2 responses, TGS will assist where required by the Controlling Authority, including provision of up-to-date monitoring information from visuals from the available vessels, and trajectory modelling.

10.10.6.3Notifications

The Vessel Master has the responsibility for notification and reporting of any spills into the marine environment (via POLREP Form contained in the vessel's SOPEP) to the AMSA Response Coordination Centre. Once this initial report has been undertaken, further reports will be sent at regular intervals to keep relevant parties (such as AMSA, TGS, NOPSEMA, etc.) informed.

The TGS CSR is responsible for advising the TGS VOM of the spill incident. The TGS VOM is then responsible for notifying NOPSEMA.

The Notification and associated timeframes for both Level 1 and Level 2 responses are outlined in **Table 148**.

Table 148 Hydrocarbon Spill Response Notifications and Timeframes

Incident Classification	Notification Timing	Authority/Company	Contact Number	Instructions
Level 1 and Level 2	Immediately	TGS VOM	[redacted]	Verbally notify TGS of event and estimated volume and hydrocarbon type.
	Within 2 hours	NOPSEMA	(08) 6461 7090	Verbally notify NOPSEMA for spills > 80 L Record notification using Initial Verbal Notification Form or equivalent and send to NOPSEMA as soon as practicable
	Within 3 days			Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification)
	Within 1 day	NOPTA	(08) 6424 5317	Provide a verbal or written incident summary
	As soon as possible	DNP	(04) 19 293 465	Provide titleholder details, time and location of incident, name of marine park likely to be affected, proposed response arrangements (as per OPEP), confirmation of providing access to relevant monitoring and evaluation reports when available, and contact details for the response coordinator.

Incident Classification	Notification Timing	Authority/Company	Contact Number	Instructions
	As soon as possible	Commercial Fishers Industry Bodies: • AFMA • ASBTIA • CFA • MFA • SEPFA • SIA • SIV • SETFIA • SRLL • TSIC • TA	AFMA: 1300 723 621 ASBTIA: [redacted] CFA: [redacted] MFA: [redacted] SEPFA: [redacted] SIA: [redacted] SIV: [redacted] SETFIA: [redacted] SRLL [redacted] TSIC: [redacted] TA: [redacted]	Verbally notify Commercial Fishers Industry Bodies of a fuel oil spill, providing details of the spill in terms of volume and where it is heading. WAFIC have made a commitment to notify commercial fishers that utilise the wider EMBA in case if a spill occurred. TGS are to be copied into the communications so they can verify the notifications have been completed.
	As soon as possible	RNTBC: Eastern Maar Aboriginal Corporation RNTBC Gunaikurnai Land and Waters Aboriginal Corporation RNTBC Gunditj Mirring Traditional Owners Aboriginal Corporation RNTBC Ngarrindjeri Aboriginal Corporation RNTBC Circular Head Aboriginal Corporation (TAS)	Eastern Maar Aboriginal Corporation RNTBC: [redacted] Gunaikurnai Land and Waters Aboriginal Corporation RNTBC: [redacted] Gunditj Mirring Traditional Owners Aboriginal Corporation RNTBC: [redacted] Ngarrindjeri Aboriginal Corporation RNTBC: [redacted] Circular Head Aboriginal Corporation (Tas): [redacted]	Verbally notify RNTBC if a fuel oil spill occurs with as much information as possible to that can be provided. A request for Native Title Holder to advice native title holder groups and any traditional owners that the spill may be of relevance too based on cultural values and sensitivities.

Incident Classification	Notification Timing	Authority/Company	Contact Number	Instructions
Level 2	Within 2 hours	AMSA	1800 641 792	Verbally notify AMSA Response Coordination Centre of the hydrocarbon spill. Follow up with a written POLREP as soon as practicable following verbal notification.
	As soon as possible if spill heading towards VIC waters	TSV MSV	1800 223 002	Verbally notify TSV MSV Follow up with a written POLREP as soon as practicable following verbal notification.
	As soon as possible if spill heading towards TAS waters	TAS EPA	(03) 6230 8600	Verbally notify TAS EPA Follow up with a written POLREP as soon as practicable following verbal notification.
	As soon as possible if spill heading towards NSW waters	NSW DoT	(02) 8202 2200	Verbally notify NSW DoT Follow up with a written POLREP as soon as practicable following verbal notification.
	As soon as possible if spill heading towards SA waters	SA DPTI	(08) 8248 3505	Verbally notify SA DPTI Follow up with a written POLREP as soon as practicable following verbal notification.

Incident Classification	Notification Timing	Authority/Company	Contact Number	Instructions
	Within 2 hours	Type II Monitoring Service Provider	To be confirmed prior to commencement	Verbally notify the nominated emergency contact person for the Type II Monitoring service provider (see **Section 10.10.7.2**). Note that the initial notification may not be able to provide key details (i.e. meeting the scientific monitoring program initiation criteria); however, will allow the service provider to commence planning activities to be at the ready. Follow up with more formal notification (includes written documentation), if and when a scientific monitoring program initiation criterion is met (see **Section 10.10.7.3**).

10.10.6.4Control Measures for Hydrocarbon Spill Response

TGS has developed a number of control measures that are necessary to ensure timely response to an emergency that result, or may result, in hydrocarbon pollution. These control measures are described in **Section 8.4.4.**

10.10.6.5Capability and Training Requirements

As part of the basic introductory and technical training, all staff will also receive environmental awareness training. TGS's QHSE Environmental Management System provides addition training where required in accordance with TGS' Environmental Standards, such as for site-specific environmental exposures etc. as all employees are responsible for environmental protection and to minimise the potential impacts on the environment.

10.10.6.6Arrangements for Testing the OPEP

Prior to the commencement of the Otway Basin 3D MC MSS the OPEP will be tested. A summary of arrangements for testing the response arrangements is provided in **Table 149**.

Table 149 Testing Requirements of the Response Arrangements

Environment Regulations	Description
Regulation 14(8B) of the Environment Regulations requires the arrangements for testing the response arrangements to include:	
A statement of the objectives of testing:	The objectives of testing are to provide an opportunity for crew to gain confidence in using the onboard spill equipment and implementing the incident response procedures. The result of this will increase efficiency in the event of an emergency, review the efficiency of procedures and detect any failures in equipment.
A proposed schedule of tests:	Three-monthly drills and exercise will be carried out on all vessels associated with the Otway Basin 3D MC MSS in line with IMO/SOPEP. The timing of the drills will be scheduled to coincide at the start of the Otway Basin 3D MC MSS. These drills will include, but not be limited to: • Spill response; • Collision and grounding; • Fire and explosion; and • Helicopter emergency.
Mechanisms to examine the effectiveness of response arrangements against the objectives of testing:	Refer to **Section 10.4**, **i**n particular: • Issues raised (if any) will be described in daily report; • Weekly checklists will ensure that spill monitoring equipment is in place and fully stocked; • Requirements described for the review of the EP and OPEP; and • Requirements described for testing below.
Mechanisms to address recommendations arising from tests:	As mentioned above, any issues raised resulting from testing will be described in the daily report. Also, the Vessel Master is made aware that any change to this OPEP and EP is managed through MoC described in **Section 10.4.6**.

Environment Regulations	Description
Regulation 14(8C) of Environment Regulations states that proposed schedule of tests must provide for the following:	
Testing the response arrangements when they are introduced:	As outlined in **Section 10.10.1** SOPEP drill conducted prior to the Seismic Survey (within three months) and at least every three months during the Seismic Survey if it proceeds that long.
Testing the response arrangements when they are significantly amended:	The MoC process described in **Section 10.4.6** details the process for any changes to be introduced to the OPEP and EP. Where these changes reasonably affect the arrangements in place, the changed arrangements will be tested prior to finalising the MoC.
Testing the response arrangements, no later than 12 months after the most recent test:	As discussed above, and in **Section 10.10.1** testing will occur every three months during the Otway Basin 3D MC MSS. If this is longer than the duration of the survey, the testing will occur when the survey starts.
If a new location for the activity is added to the EP after the response arrangements have been tested, and before the next test is conducted — testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan:	TGS will not be undertaking work outside of the OA described within **Section 3.2.1.**
If a facility becomes operational after the response arrangements have been tested and before the next test is conducted—testing the response arrangements in relation to the facility when it becomes operational:	Not applicable to the Otway Basin 3D MC MSS.

10.10.7 Operational and Scientific Monitoring Plan

The OSMP is set out in **Appendix O**. This sets out the framework for developing a specific OSMP following an oil spill based on the parameters of the spill, including the location, nature and scale of the spill, and any potentially impacted values including sensitive resources.

As part of the initial response, TGS and the Seismic Vessel operator will provide a first-strike response (i.e. local or initial resources to stop or contain spill) at the direction of the Controlling Authority and provide ongoing response and monitoring arrangements where requested.

10.10.7.1Type I Operational Monitoring

As outlined in the OSMP and within **Section 8.3**, Type I 'Operational Monitoring' will be implemented where safe to do so and when there is a net benefit in doing so (as agreed with the Controlling Authority). This monitoring will be implemented to:

- Determine the extent and character of a spill;
- Visual tracking of the movement/ trajectory of surface slicks;
- Identify areas/ resources potentially affected by surface slicks; and
- Determine sea conditions/ other constraints.

This monitoring will enable the Vessel Master to provide the necessary information to the relevant Controlling Authority, via a POLREP form, to determine and plan appropriate response actions under the National Plan and the relevant State plan. Operational monitoring and observation in the event of a spill will inform an adaptive spill response and scientific monitoring of relevant key sensitive receptors.

Ongoing situational awareness information is provided to the Controlling Authority through the use of a Marine Pollution Situation Report.

For a Level 2 spill, TGS will undertake real-time spill trajectory modelling to provide assurances that response options can be tailored to the specific spill situation. The modelling will be based on continuous weather monitoring which will be utilised in conjunction with hindcast data to predict any potential beaching locations of the hydrocarbon, if any exist. This real-time spill trajectory modelling will be utilised to focus any potential scientific monitoring if it were to be required (and directed by the Controlling Authority) in order to monitor the impacts from a spill occurrence. Further discussion on scientific monitoring is detailed within the OSMP and summarised in **Section 10.10.7.2**.

Field-based monitoring, including vessel and/or aerial surveillance, will be undertaken immediately following a spill event. This monitoring will enable the Vessel Master to provide up-to-date information to the relevant Controlling Authority via the POLREP form to appropriate plan any response options. This field-based monitoring will be utilised further in the development of any scientific monitoring of key sensitive receptors if scientific monitoring is required and requested by the Controlling Authority. Field-based monitoring has its limitations in that it can only be conducted during daylight hours when the surface slick is visible.

TGS will assist with further operational monitoring (including funding if required) as directed by the Controlling Authority.

10.10.7.2Type II Scientific Monitoring

In consultation with the Controlling Authority, TGS will commit to scientific monitoring dependent on the circumstances of the spill, and the sensitivities at risk. The proposed approach to any detailed scientific monitoring is set out in the OSMP. For the purpose of this EP, it is not considered that more detailed Scientific Monitoring Plans are required to be developed or environmental baseline monitoring is required prior to the Otway Basin 3D MC MSS commencing due to the potential risks associated with the Otway Basin 3D MC MSS and a hydrocarbon spill through vessel collision are considered very low with all of the associated control measures in place. The identified potential risks are assessed as short term, transient and in the very unlikely even that it did occur, it is unlikely to cause significant impact on the marine environment given the likely volumes and nature of the MDO onboard the Seismic Vessel. It is considered that this proposed approach is reasonable for the Otway Basin 3D MC MSS as existing control measures, including meeting all of the legislative requirements and industry standards, will reduce the risk or a hydrocarbon spill to the marine environment.

As discussed in **Section 10.10.4**, it is recognised that there is a remote chance of shoreline contact depending on the location of a hydrocarbon spill. Therefore, TGS commit to having a service agreement with a service provider prior to the commencement of the Otway Basin 3D MC MSS. This agreement will ensure TGS has a capability to undertake Type II monitoring if required and also enable the chosen service provider to act (in a capacity as agreed with all parties), to either assist the Controlling Authority or to undertake key Type II monitoring activities on TGS's behalf (if initiation criteria are triggered).

10.10.7.2.1 Type II – Scientific Monitoring Services Agreement

As outlined above, prior to the commencement of the Otway Basin 3D MC MSS, TGS will commit to having a service agreement with a service provider who have demonstrated capability to undertake Type II Monitoring. Prior to agreement with a third-party service provider, they must demonstrate they have the following capabilities:

- Emergency manned mobile telephone number;
- Capacity to prioritise and deploy qualified personnel to execute each scientific monitoring plan (**Section 10.10.7.3**);
- Qualifications and capacity to prepare detailed supporting sampling analytical plans/ monitoring plans for each of the scientific monitoring plans described in **Section 10.10.7.3**;
- The ability to prioritise and mobilise resources to the region (i.e. logistics are in place); or resources are located within the region; and
- Capacity to mobilise personnel and resources to the region as soon as practicable.

After agreeing to a services agreement, should the service provider suggest amendments of **Section 10.7**, this will be managed through the MoC process outlined in **Section 10.4.5**.

A notification will be provided to the service provider within two hours of a known spill event, so the service provider can be 'at the ready', even in the event initiation criteria are not yet triggered.

10.10.7.2.2 Situational Awareness

In the event of a hydrocarbon spill, details that will be exchanged between TGS and the service provider describing situational awareness will include:

- Hydrocarbon type and size of spill;
- Is the spill under control;
- Potential environmental or external influences that may impact a monitoring response;
- Predicted behaviour and predicted trajectory of the spill;
- Potential sensitivities at risk;
- Any ongoing safety concerns; and
- Protection priorities.

10.10.7.3Scientific Monitoring Plans

The framework for implementing SMPs is set out in the OSMP document, **Appendix O**. The service provider will develop and implement a variety of scientific monitoring plans if and when the initiation criteria are met (**Table 150**). The monitoring plan(s) required in the event of a Level 2 hydrocarbon spill are assessed based on the nature and scale of the MCS and the situational awareness at the time of any spill.

Due to the potential beaching of a hydrocarbon spill as identified by modelled scenarios, a number of monitoring plans may be required to monitor the potential impacts of a hydrocarbon spill. **Table 150** provides rationale for the various monitoring plans that would be developed.

Any monitoring plans that are implemented are required to be adaptive to allow key sensitivities at risk to be identified. Such as, if a Controlling Authority makes a reasonable request for monitoring to be undertaken on a receptor which isn't specified here, any service agreement will provide TGS with the capacity to react to these requests.

Table 150 Scientific Monitoring Plan Aims, Objectives and Rationale

Scientific Monitoring Plan	Key Receptor(s)	Aim	Objective	Rationale
Marine water quality	Background water quality	To monitor the hydrocarbons in marine waters to support assessment of impacts and recovery of sensitivities and to verify hindcast modelling	Assess and document the extent and severity of hydrocarbon contamination utilising observations and/or in-water measurements made during operational monitoring. Provide data to inform further scientific monitoring plans.	Reductions in water quality are likely to result due to aromatic hydrocarbons being entrained within the water column. Subsequent partitioning, including to the water column, is expected. Impacts on the water quality from a hydrocarbon spill are important to understand and evaluate as this will potentially impact a range of other receptors, and data will be used to inform other monitoring plans described below.
Intertidal and shoreline sediment quality	Background sediment quality, particularly focused on sensitive locations	Gain an understanding of the characteristics, persistence, and fate of spilled hydrocarbons within sediments exposed to beached oil	Estimate spilled hydrocarbon concentrations within sediment exposed to beached oil. Monitor changes over time in hydrocarbon concentrations. Provide data to assist assessment of impacts on benthic communities. Establish necessary response options.	Should a spill of hydrocarbons reach the shoreline it has the potential to impact on the sediment quality, and as such impact on intertidal biota (described below) which may be exposed to chronic toxicity levels of hydrocarbons.
Intertidal and shoreline habitats and benthos	Invertebrates, filter feeders, benthic primary producers, demersal fish, shorelines and intertidal habitats	Determine the impacts of spilled hydrocarbons on intertidal benthos and habitats	Monitor impacts on intertidal and shoreline habitats from beached hydrocarbon contamination. Define recovery parameters for benthos. Monitor benthos recovery to hydrocarbon contamination. Establish necessary response options.	Shoreline habitats can be impacted from a spill through stranded floating hydrocarbons, or droplets entrained within the water column, with hydrocarbons becoming increasingly entrained within the nearshore waters. Aquatic organisms utilising these habitats can be exposed to elevated levels of hydrocarbons over their thresholds which will ultimately impact the organism.

Scientific Monitoring Plan	Key Receptor(s)	Aim	Objective	Rationale
Seabirds and shorebirds population and recovery	Foraging seabirds and coastal shorebird populations	Assess impacts on seabird and shorebird populations.	Quantify foraging, nesting or breeding seabird and shorebird populations potentially impacted by spilled hydrocarbons. Quantify oiled avifauna, including mortalities. Establish necessary response options.	Seabirds and shorebirds can be impacted by hydrocarbons spills through the presence of hydrocarbons on the surface of the water and from hydrocarbons entrained within the water column. This can lead to potential behavioural, physiological and physical impacts such as deviation from migratory routes, disruption to their indigestion and/or coating their feathers resulting in the inability to fly.
Marine fauna (excluding avifauna)	Marine mammals, marine reptiles, bony fish, elasmobranchs	Assess impacts on non-avian marine fauna potentially impacted by a hydrocarbon spill.	Quantify oiled marine fauna, including mortalities.	Hydrocarbon spills resulting in a surface slick or entrained within the water column has the potential for long-term impacts to marine fauna. Contact between marine fauna and a surface slick or in-water concentrations of hydrocarbon has the potential to elicit lethal and sub-lethal impacts, including behaviour (avoidance of foraging habitats or migratory routes), physiological (inability to digest) and/or physical effects.
Socio economic impact monitoring (fisheries and tourism)	Target species or areas of importance for fishing/tourism	Assess impacts on fisheries (including aquaculture) and tourism activities	Monitor hydrocarbon concentration within tissue of species targeted by commercial fisheries. Identify potential impacts on human health as a result of hydrocarbon contamination. Assess recovery of tourism operations in area affected.	Commercial fishing operations for pelagic fish, lobster fisheries, shellfish can be impact from a hydrocarbon spill which can include lethal and sub-lethal physiological and physical effects. Any exposure to commercial and recreational target species can result in the tainting of flesh and increase in toxicity above human consumption thresholds. In terms of tourism, a hydrocarbon spill can result in a negative perception on the environment impacted by the spill.

10.10.7.3.1 Development of Detailed Scientific Monitoring Plans

The agreed service provider will develop detailed scientific monitoring plans after receiving the initial notification in the event of a spill, and when the initiation criteria outlined in **Table 150** have been met. A draft scientific monitoring plan will be provided to TGS as soon as practicable, but within 24 hours after receiving the initial notification that a hydrocarbon spill has occurred. A final proposed monitoring plan will then be provided to the relevant Controlling Authority for review as soon as practicable, but within 24 hours of initial notification.

The monitoring plans will include, as a minimum:

- Objectives and rationale of the monitoring plan: Each plan developed will outline the key objectives, rationale and focus of the plan;
- Baseline information: It is important for each monitoring plan to specify the details of the baseline to be applied, or a method for selection of suitable reference/control sites. If possible, previous monitoring from published studies and findings is to be utilised;
- Spatial awareness: It is important for any scientific monitoring plan to provide information and outcomes obtained from the operational monitoring (such as real-time spill trajectory modelling) to support the proposed design;
- Methodology: The proposed survey methodology should consider the statistical methods and sampling effort required to achieve the objectives of the scientific monitoring plan. If sampling is proposed as part of the monitoring plan, industry recognised methods for collection and analysis of the samples must be used. This includes utilising accredited laboratories and following best practice guidelines and applicable legislation where applicable. The methodology should include, as a minimum:
- Details of any permits or approvals required to undertake the work, including whether there are any exemptions;
- Collection and analysis requirements (i.e. permits);
- Personnel proposed to undertake the monitoring, including appropriate qualifications and skills;
- Equipment required to complete the proposed monitoring;
- HSSE requirements to complete the survey;
- QA/QC requirements if appropriate;
- Initiation criteria: The criteria used to initiate the proposed scientific monitoring plan;
- Termination criteria: Each monitoring plan will include a termination date at which time the monitoring can stop which is consistent with the objectives of the monitoring plan. These criteria must be adaptive and be able to change based on the actual circumstances of the impacts and/or risks of assessment;
- Management of change: The monitoring plans must be adaptive to ensure the impacts and risks are managed appropriately. As such, if a monitoring plan is required to change to adapt to these circumstances, then a process for change needs to be detailed so that any revision is provided to TGS and the relevant Controlling Authority for acceptance as soon as practicable. Any revisions undertaken must be tracked to clearly communicate the current status of the monitoring requirements; and

- Reporting: Each monitoring plan is required to detail the reporting of results during and post monitoring. This reporting will include ongoing situation reports during the implementation of monitoring; the timing of these situation reports will be based on the nature and scale of the impacts/risks. Post monitoring, a draft report and third-party peer reviewed report will be provided to TGS, the Controlling Authority and NOPSEMA which will include any recommendations resulting from the monitoring plan.

10.10.7.3.2 Implementation of Scientific Monitoring Plans

During the development of the monitoring plan(s) outlined in **Section 10.10.7.3** above, the service provider will undertake all planning actions required to mobilise to the site. This will include providing a brief proposal to TGS which will outline the resources and personnel required, transport arrangements and timeframes for implementation. The service provider will undertake all reasonable measures to mobilise to the site as soon as practicable. The ability for the service provider to mobilise within 24 hours will be required under the service agreement.

Due to the low likelihood of a spill occurring, it is not considered reasonable to have these resources on standby during the Otway Basin 3D MC MSS. It would require considerable financial investments over and above the significant control measures implemented to reduce the risks of a vessel collision to **ALARP** and **Acceptable Levels**. Therefore, TGS consider the approach outlined above to be reasonably practicable based on the nature and scale of the risks associated with the Otway Basin 3D MC MSS.

10.10.7.3.3 Initiation Criteria for Scientific Monitoring Plan

The initiation criteria (**Table 151**) for each monitoring plan is broadly applied to enact the response described within this EP. However, it is important to note that the final decision to commence each monitoring plan will be based on the net environmental benefit in which the environmental sensitivities should be avoided if the monitoring proposed may reasonably result in further impacts and offer no net benefit.

Table 151 Scientific Monitoring Plan Initiation Criteria

Plan	Initiation Criteria
Marine water quality	Notification of a Level 2 or greater hydrocarbon spill.
Intertidal and shoreline sediment quality	Notification of a Level 2 or greater hydrocarbon spill. and Where modelling and/or Operational Monitoring indicates likely exposure to intertidal and/or shoreline sediments. or Reports are received of shoreline and/or shoreline contact from hydrocarbon spill.
Intertidal and shoreline habitats and benthos	Notification of a Level 2 or greater hydrocarbon spill. and Where modelling and/or Operational Monitoring indicates likely exposure to intertidal and/or shoreline habitats or benthos. or Reports are received of shoreline and/or shoreline contact from hydrocarbon spill.

Plan	Initiation Criteria
Seabirds and shorebirds population and recovery	Notification of a Level 2 or greater hydrocarbon spill. and Where modelling and/or Operational Monitoring indicates likely exposure to seabird and/or shorebird populations. and/or Reports are received of contact with avifauna from hydrocarbon spill. and/or Reports of oiled or dead avifauna are received.
Marine fauna (excluding avifauna)	Notification of a Level 2 or greater hydrocarbon spill. and Where modelling and/or Operational Monitoring indicates likely exposure to non-avian marine fauna. and/or Reports are received of contact with non-avian marine fauna from hydrocarbon spill. and/or Reports of oiled or dead non-avian marine fauna are received.
Socio economic impact monitoring (fisheries, aquaculture and tourism)	Notification of a Level 2 or greater hydrocarbon spill. and Where modelling and/or Operational Monitoring indicates likely exposure to aquaculture operations. and/or Reports are received of commercial fisheries closures due to hydrocarbon contamination. and/or Reports are received of tourism operation closures due to hydrocarbon contamination.

10.10.7.3.4 Termination Criteria for Scientific Monitoring Plan

Each scientific monitoring plan that is undertaken as part of a response operation will continue until certain termination criteria have been met (**Table 152**), in consultation with the relevant Controlling Authority.

Table 152 Scientific Monitoring Plan Termination Criteria

Plan	Termination Criteria
Marine water quality	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Monitoring data of in-water concentrations of hydrocarbons have been compiled and analysed. Data confirm water concentrations are at background/reference levels. Reporting on sampling has been completed detailing extent and severity of spilled hydrocarbons which can enable further analysis of impacts on other receptors in any further scientific monitoring plans.

Plan	Termination Criteria
Intertidal and shoreline sediment quality	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens/beaching are predicted by the modelling. Any monitoring undertaken confirms concentrations of hydrocarbons present within sediments fall below relevant receiving guidelines (e.g. ANZG, 2018), and pose low to negligible ecological risk. Reporting on the sampling has been completed detailing the extent and severity of spilled hydrocarbons which can enable further analysis of impacts on benthic communities.
Intertidal and shoreline habitats and benthos	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens/beaching are predicted by the modelling. Impacts from hydrocarbon spill on benthos are quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on benthos.
Seabirds and shorebirds population and recovery	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens/beaching are predicted by the modelling. Objectives and values associated with any relevant avian species recovery plans and/or conservation advice's have been met. Impacts from hydrocarbon spill on avifauna quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on avifauna.
Marine fauna (excluding avifauna)	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Objectives and values associated with any relevant species recovery plans and/or conservation advice have been met. Impacts from hydrocarbon spill on marine fauna (excluding avifauna) quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on marine fauna (excluding avifauna).
Socio economic impact monitoring (fisheries, and tourism)	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Impacts to important commercial fisheries quantified and recovery evaluated. Impacts to seafood quality and secondary impacts on human health evaluated. Impacts on tourism ventures quantified and evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on commercial fisheries, and tourism operations.

10.10.8 OPEP Review and Revision

In accordance with subregulation 14(8) of the Environment Regulations, the OPEP will be reviewed, updated and resubmitted to NOPSEMA should a change to the existing OPEP be required. It is considered, such changes to the OPEP could arise due to:

- A change to the EP that may impact spill response capabilities or coordination, such as an increase to the potential risk of a spill or release of hydrocarbons;
- When a significant change to the activities currently included within this EP has occurred, which could have implications on spill response or coordination;

- During routine testing of the OPEP, where improvements or corrections of the current OPEP are identified; and
- Any learnings from the result of a Level 1 or Level 2 spill or incident.

Any changes made to the OPEP, and any subsequent resubmission will be informed by the Environment Regulations or any other relevant Commonwealth regulations. If a change to the OPEP is required, TGS will undertake this in accordance with the MOC procedures defined in **Section 10.4.7.**

The TGS Project Manager will be responsible for the OPEP and ensuring that any relevant updates are made to the OPEP, and should any amendments be required, that the revised plan is submitted to NOPSEMA.

10.11 Continuous Improvement

TGS' HSE-MS ensures that the organisation supports the culture, processes and structures required to identify and manage potential quality, health, safety and environment risks or hazards over the life of its activities and operations. TGS's and its employees are committed to continual improvement of the standards, quality and safety of its products, activities, and services through regular, periodic review of internal HSE policies, procedures, processes and systems throughout all aspects of its business.

In accordance with the TGS' Environmental Policy and Health and Safety Policy, all employees and contractors are actively encouraged to identify and suggest improvements to existing standards, processes and systems and monitor the results of continuous improvement efforts, as described within TGS's HSE-MS and throughout this EP.

11 Conclusion

This EP has been prepared to support TGS' application process for the Otway Basin 3D MC MSS. This MSS is planned to commence in Q4 2023 and will cover an AA of 45,000 km^2. The maximum number of days acquired per calendar year will be 200 days. The Otway Basin 3D MC MSS will be completed by 31 December 2028. The majority of the planned sail lines lie within water depths greater than 500 m, however, a single 2D tie line will enter shallower waters of approximately 115 m. The single tie line represents a few hours of acoustic acquisition in shallower waters.

As part of developing the EP, an EMBA was derived utilising stochastic hydrocarbon dispersion and fate modelling (**Appendix C**) which provides a conservative area that may be impacted by the Otway Basin 3D MC MSS. A comprehensive description of the key physical, biological, socio-economic, and cultural characteristics of the existing environment and the sensitivities and receptors has focused on the EMBA.

This EP assesses the potential risks and associated impacts from the Otway Basin 3D MC MSS on the biological and socioeconomic values of the EMBA, employing three key methods: 1) an extensive literature review; 2) project specific UAM to examine the spatial spread and magnitude of acoustic outputs from the Otway Basin 3D MC MSS and to predict how this would affect various receptors; and 3) extensive consultation with relevant persons (which will continue for the life of the project).

UAM (**Appendix B**) was undertaken to predict received SELs and spread of noise emissions, or the 'footprint' of acoustic emissions generated from the acoustic source utilised for data acquisition during the Otway Basin 3D MC MSS. The UAM involved three key components: array source modelling; underwater acoustic propagation modelling; and animat modelling. The results from the UAM were then compared with a variety of noise criteria and sound levels identified in scientific research to cause the onset of PTS and TTS in sensitive marine receptors.

Through the development of the EP, TGS has undertaken an extensive consultation programme with relevant persons, including traditional owner groups, commercial and recreational fishers, industry bodies and associations, marine park authorities, tourism operators, researchers, etc. The review and updates to the consultation programme, following the High Court Decision and NOPSEMA's Consultation Guidance Document, and subsequent iterations of the consultation process has provided TGS with a deep level of understanding with regard to the potential impacts (both real and perceived) from relevant persons on their sensitivities. The nature of responses varied; some included requests for further information, to be kept informed, some noted that the proposed survey was not relevant for their interest in the area, while some raised concerns/objections to the Otway Basin 3D MC MSS. These claims are considered to be adequately addressed through the development of this EP.

One of the key sensitivities identified through the preparation of the EP was the proximity of the OA to the BW BIAs and the SRW Ag BIA. TGS recognises that the potential to encounter whales increases as the Otway Basin 3D MC MSS approaches and overlaps these BIAs, particularly as the Seismic Vessels moves towards more coastal waters. In addition to Standard and Additional Control Measures (as per Policy Statement 2.1), TGS has proposed several control measures in relation to the location of the BW and SRW BIAs which were developed in consultation with Blue Whale Study.

The following is a summary of these control measures, with the full suite of marine mammal control measures provided in **Appendix M** as a separate summary document:

- An Extended Observation Zone for PW/PBWs and SRW such that vessel based MFOs will observe for PW/PBWs and SRWs as far as practicable, and to a minimum of 7 km during daylight hours

- An Extended 7 km Shut-down Zone for BW/PBWs and SRWs whereby if a BW/PBW or SRW is detected within this zone, the acoustic source will be immediately shut down and the vessel will relocate to another area at least 32 km from the last PBW sighting or at least 11 km from the last SRW sighting. This distance increases to 42 km if a SRW calf is sighted;
- If relocation in response to the sighting of a BW/PBW or SRW is not possible (as per the above bullet point), acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW or SRW has been detected in the 7 km Extended Shut-down Zone;
- Soft-start Procedures at night or during periods of low visibility will be limited to circumstances when acquisition has occurred within the preceding 24 hours and no whale initiated shut-downs have been made during this period, and may only occur outside of the BW BIAs and buffers, and the SRW Ag BIA/buffer;
- Poor visibility or night-time operations may occur provided that no BW/PBW shut-downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition and no SRW shut-downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition;
- PAM will be implemented on the Seismic Vessel and will operate 24-hours per day for the duration of the Otway Basin 3D MC MSS while the acoustic source is in the water and during the 30 minutes before the commencement of any Soft-start Procedure;
- If a mother and calf SRW pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Otway Basin 3D MC MSS, the acoustic source will be immediately shut-down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures;
- Aerial surveys will be flown, if possible, within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer during April and October, and within the seven days prior to commencement of any acquisition in the BW BIAs/buffers. Any sightings of SBT aggregations observed during aerial surveys will also be reported to ASBTIA; and
- 2D tie line acquisition inside any BW/PBW or SRW BIA/buffer will only be permitted to occur providing specific criteria (e.g. aerial surveys, restrictions on total time acoustic source is active within BIA/buffer) have been met, acquisition occurs in daylight hours only, and two MFOs are on-duty on the Seismic Vessel and two MFOs are on-duty on the Attending Support Vessel.

In addition to the above control measures tailored to the BW/PBWs and SRWs, TGS has developed a suite of control measures to ensure that the impacts and risks from the planned and unplanned activities associated with the Otway Basin 3D MC MSS are reduced as far as practicable. For example, the OA was reduced following consultation with South Australian tuna fishers to remove areas of the survey from South Australian waters, and a Giant Crab Exclusion Area will be established in waters 1,000 m or less near the 2D tie line to protect TAS giant crab habitat and fisheries.

In light of the extensive suite of proposed controls, the overall conclusion from the environmental risk assessment is that the impacts from the Otway Basin 3D MC MSS have been reduced to **ALARP** and **Acceptable Levels**. The survey will fully comply with all relevant legislation and industry best practice, and all EPSs provided within the accepted EP.

12 References

Abbriano, R.M., Carranza, M.M., Hogle, S.L., Levin, R.A., Netburn, A.N., Seto, K.L., Snyder, S.M., Franks, P.J.S., 2011. '*Deepwater Horizon oil spill: a review of the planktonic response*'. Oceanography, 24(3): 294 – 301.

Abdul Wahab, M.A., Radford., B., Fromont, J., Hosie, A.M., Miller, K., Heyward, A., 2019. '*The diversity and distribution of mesophotic benthic invertebrates at Ningaloo Reef, Western Australia*'. Marine Biodiversity, 49, 2871-2886.

Aerts, L., Blees, M., Blackwell, S., Greene, C., Kim, K., Hannay, D., Austin, M., 2008. '*Marine mammal monitoring and mitigation during BP Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008*': 90-day report. Document Number LGL Report P1011-1. Report by LGL

AFMA, 2022. '*Orange roughy (Hoplostehus atlanticus) Stock Rebuilding Strategy*'. https://www.afma.gov.au/sites/default/files/2023-02/orange-roughy-rebuilding-strategy-2022.pdf

AFMA, 2023a. '*Southern bluefin tuna*'. www.afma.gov.au/fisheries-management/species/southern-bluefin-tuna.

AFMA, 2023b. *About 'AFMA'*. https://www.afma.gov.au/about/about-afma.

Aguilar de Soto, N., Delorme, N., Atkins, J., Howard, S., Williams, J., Johnson, M., 2013. *'Anthropogenic noise causes body malformations and delays development in marine larvae'*. Scientific Reports 3: 2831.

Aguilar Soto, N., Johnson, M., Madsen, P.T., Tyack, P.L., Bocconcelli, A., Borsani, J.F., 2006. *'Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (Ziphius cavirostris)?'* Marine Mammal Science, 22(3): 690 – 699.

AIATSIS, accessed March 2023. Available at: https://aiatsis.gov.au/explore/map-indigenous-australia

Ainslie, M.A., 2008. '*Review of published safety thresholds for human divers exposed to underwater sound*'. Report TNO-DV-2007-A598. DTIC Document, TNO Defence Security and Safety, The Hague (Netherlands). 17p.

Allen, J.K., Peterson, M.L., 2012. '*Radiated noise from commercial ships in the Gulf of Maine: implications for whale/vessels collisions*'. The Journal of the Acoustical Society of America, 132: EL229.

Almeda, R., Connelly, T.L., Buskey, E.J, 2016. How much crude oil can zooplankton ingest? Estimating the quantity of dispersed crude oil defecated by planktonic copepods. Environmental Pollution, Volume 208, Part B, Pages 645-654. https://doi.org/10.1016/j.envpol.2015.10.041

Almeida, J.R., Gravato, C., Guilhermino, L., 2012. '*Challenges in assessing the toxic effects of polycyclic aromatic hydrocarbons to marine organisms: a case study on the acute toxicity of pyrene to the European seabass (Dicentrarchus labrax L.)*'. Chemosphere, 86(9): 926 – 937.

Alonso-Alvarez, C., Munilla, I., Lopez-Alonso, M., Velando, A., 2007. '*Sublethal toxicity of the Prestige oil spill on yellow-legged gulls*'. Environment International, 33(6): 773 – 781.

Amorim, M.C.P., Vasconcelos, R.O., Fonseca, P.J., 2015. '*Fish sounds and mate choice. Sound communication in fishes*'. Springer, Berlin, pp. 1 – 33.

Amoser, S., Ladich, F., 2003. '*Diversity in noise-induced temporary hearing loss in otophysine fishes*'. The Journal of the Acoustical Society of America, 113(4), pp.2170-2179.

AMSA, 2019. '*National Plan for Maritime Environmental Emergencies – 2019 Edition*'. AMSA, Australian Government.

André, M., Kaifu, K., Sole, M., van der Schaar, M., Akamatsu, T., Balastegui, A., Sanchez, A.M., Castell, J.V., 2016. '*Contribution to the understanding of particle motion perception in marine invertebrates*'. In Popper, A.N., Hawkins, A. (Eds), The effects of noise on aquatic life II, Advances in Experimental Medicine and Biology, 875.

André, M., Kamminga, C., 2000. '*Rhythmic Dimension in the Echolocation Click Trains Of Sperm Whales, A Possible Function Of Identification And Communication*'. Journal of the Marine Biological Association of the UK 80: 163-169.

André, M., Soler, M., Lenoi, M., Dufrot, M., Quero, C., Alex, M., Antoni, L., Van Der Schar, M., Lopez-Bejar, M., Morell, M., Zaugg, S., Houegnigan, L, 2011. '*Low-Frequency Sounds Induce Acoustic Trauma In Cephalopods*'. Frontiers in Ecology and the Environment, 9: 489-493.

Andrews-Goff, V., Bestley, S., Gales, N.J., Laverick, S.M., Paton, D., Polanowski, A.M., Schmitt, N.T., Double, M.C., 2018. '*Humpback whale migrations to Antarctic summer foraging grounds through the southwest Pacific Ocean*'. Scientific Reports, 8, doi: 10.1038/s41598-018-30748-4.

Andriguetto-Filho, J.M., Ostrensky, A., Pie, M.R., Silva, U.A., Boeger,W.A., 2005. '*Evaluating the impact of seismic prospecting on artisanal shrimp fisheries*'. Continental Shelf Research, 25: 1720-1727.

Ansari, Z.A., Desilva, C., Badesab, S., 2012. '*Total petroleum hydrocarbon in the tissue of some commercially important fishes of Bay of Bengal*'. Marine Pollution Bulletin, 64: 2564 – 2568.

Anthony, T.G., Wright, N.A., Evans, M.A., 2010. '*Review of diver noise exposure*'. International Journal of the Society for Underwater Technology, 29(1), 21 – 39.

Antrim, L.D., Thom, R.M., Gardiner, W.W., Cullinan, V.I., Shreffler, D.K., Bienert, R.W., 1995. '*Effects of petroleum products on bull kelp (Nereocystis luetkeana)*'. Marine Biology, 122: 23 – 31.

APPEA, 2013. '*A compilation of recent research into the marine environment: Blue Book 05*'. Published by the Australian Petroleum Production and Exploration Association (APPEA), Canberra, Australia. Available online at: https://www.appea.com.au/wp-content/uploads/2013/05/BLUE-BOOK_A_Compilation_of_Recent_Research_into_the_Marine_Environment.pdf

APPEA, 2015. '*Reference document: Seismic surveys*'. https://www.appea.com.au/wp-content/uploads/2015/03/15-02-Ref-Doc_Seismic-V5.pdf

Argüelles, M.B., Coscarella, M., Fiorito, C., Bertellotii, M., 2021. '*Southern right whales generally appear not to react to transiting research vessels*'. Marine Mammal Science, 38: 6 – 17.

Arnold, P., Marsh, H., Heinsohn, G., 1987. '*The occurrence of two forms of minke whales in east Australian waters with a description of external characters and skeleton of the diminutive or dwarf form*'. Sci. Rep. Whales Res. Inst., 38: 1 – 46.

Arnould, J.P.Y., Kirkwood, R., 2008. '*Habitat selection by female Australian fur seals (Arctocephalus pusillus doriferus)*'. Aquatic Conservation: Marine and Freshwater Ecosystems. 17:S53-S67.

Aroyan, J.L., McDonald, M.A., Webb, S.C., Hildebrand, J.A., Clark, D., Laitman, J.T, Reidneberg, J.S., 2000. '*Acoustic Models Of Sound Production And Propagation*'. In: Hearing by Whales and Dolphins, Ed: W.W.L. Au, A.N. Popper & R.N. Fay", 409-469 p. Springer, New York, U.S.

Attard, C.R.M., Beheregaray, L.B., Jenner, C., Gill, P., Jenner, M., Morrice, M., Bannister, J., LeDuc, R., Möller, L., 2010. '*Genetic diversity and structure of blue whales (Balaenoptera musulus) in Australian feeding aggregations*'. Conserv. Genet., doi:10.1007/s10592-010-0121-9.

Aulich, M.G., McCauley, R.D., Miller, B.S., Samaran, F., Giorli, G., Saunders, B.J., Erbe, C., 2022. '*Seasonal Distribution of the Fin Whale (Balaenoptera physalus) in Antarctic and Australian Waters Based on Passive Acoustics*'. Front. Mar. Sci. 9:864153. doi: 10.3389/fmars.2022.864153

Aulich, M.G., McCauley, R.D., Saunders, B.J., Parsons, M.J.G., 2019. '*Fin whale (Baelenoptera physalus) migration in Australian waters using passive acoustic monitoring*'. Scientific Reports 9: 8840.

Australian Bureau of Statistics. (ABS), 2023. Available at :https://www.abs.gov.au/

Australian Marine Mammal Centre (AMMC), 2019. '*Recovery status and ecology of Southern hemisphere fin whales*'. Available from: http://www.marinemammals.gov.au/sorp/southern-hemisphere-fin-whales .

Backhouse, G., Jackson, J., O'Connor, J., 2008. '*National Recovery Plan for Australian Grayling Prototroctes maraena*'. Department of Sustainability and Environment, Melbourne. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-australian-grayling-prototroctes-maraena.

Backus, R.H., Schevill, W.E., 1966. ''*Physeter clicks*,'' in Whales, Dolphins, and Porpoises, edited by K. S. Norris, University of California Press, Berkeley, pp. 510–528.

Baines, P.G., Edwards, R.J., Fandry, C.B., 1983. '*Observations of a New Baroclinic Current along the Western Continental Slope of Bass Strait*'. Aust. J. Mar. Freshw. Res., 34, 155 – 157.

Balcioglu, E.B., 2016. '*Potential effects of polycyclic aromatic hydrocarbons (PAHs) in marine foods on human health: a critical review*'. Toxin Reviews, 35(3-4): 98 – 105.

Balsiero, A., Espi, A., Marquez, I., Perez, V., Ferreras, M.C., Garcia Marin, J.F., Prieto, J.M., 2005. '*Pathological features in marine birds affected by the Prestige's oil spill in the north of Spain*'. Journal of Wildlife Diseases, 41 (2): Pp 371 – 378.

Bannister, J.L., 2017. '*Project A7- Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia 2015-2018*'. Final report to National Environment Science Program, Australian Commonwealth Government.

Bannister, J.L., Kemper, C.M., Warneke, R.M., 1996. '*The Action Plan for Australian Cetaceans*'. Australian Nature Conservation Agency. Available from http://www.environment.gov.au/resource/action-plan-australian-cetaceans

Barrett-Lennard, L., Ford, J., Heise, K., 1996. '*The mixed blessing of echolocation: differences in sonar use by fish-eating and mammal-eating killer whales*'. Animal Behaviour 51: 553–565.

Barton, J., Pope, A., Howe, S., 2012. '*Marine Natural Values Study Vol 2: Marine Protected Areas of the Otway Bioregion*'. Parks Victoria Technical series No. 75. Parks Victoria, Melbourne Baylis, A. M., Page, B., & Goldsworthy, S. D., 2008. Effect of seasonal changes in upwelling activity on the foraging locations of a wide-ranging central-place forager, the New Zealand fur seal. Canadian Journal of Zoology, 86(8), 774–789.

Bass, A.H., Ladich, F., 2008. '*Vocal-Acoustic Communication: From Neurons To Behaviour*'. In: Webb JF, Fay RR, Popper AN, editors. Springer handbook of auditory research. Vol. 32. New York: Springer. Pages 253–278.

Basson, M., Hobday, A.J., Eveson, J.P., Patterson, T.A., 2012. '*Spatial Interactions Among Juvenile Southern Bluefin Tuna at the Global Scale: A Large Scale Archival Tag Experiment*'. FRDC Report 2003/002.

Battershill, C., Cappo, M., Colquhoun, J., Cripps, E., Jorgensen, D., McCorry, D., Stowar, M.. Venables, B. 2008. '*Coral damage monitoring using towed video (TVA) and photo quadrat assessments (PQA). Maxima 3D Marine Seismic Survey at Scott Reef. Adaptive Management Program Objective 3 – Coral Damage Monitorin*g'. Final Report. Report for Environmental Resources Management Australia, Perth, Western Australia.

Baumgartner, M.F., Bonnell, J., Van Parijs, S.M., Corkeron, P.J., Hotchkin, C., Ball, K., Pelletier, L-P., Partan, J., Peters, D., Kemp, J., Pietro, J., Newhall, K., Stokes, A., Cole, T.V.N., Quintana, E., Kraus, S.D., 2019. '*Persistent near real-time passive acoustic monitoring for baleen whales from a moored buoy: system description and evaluation*'. Methods in Ecology and Evolution, 10: 1476 – 1489.

Baumgartner, M.F., Mate, B.R., 2003. '*Summertime foraging ecology of North Atlantic right whales*'. Marine Ecology Progress Series, 264: 123 – 135.

Baumgartner, M.F., Van Parijs, S.M., Wenzel, F.W., Tremblay, C.J., Esch, H.C., Warde, A.M., 2008. '*Low frequency vocalizations attributed to sei whales (Balaenoptera borealis)*'. Journal of the Acoustical Society of America, 124(2): 1339 – 1349.

Bax, N., Williamson, A., Aguero, M., Gonzalez, E., Geeves, W., 2003. 'Marine Invasive Alien Species: A Threat To Global Biodiversity'. Marine Policy, 27:313-323.

Baylis, A.M.M., Page, B., Goldsworthy, S.D., 2008. '*Effect of seasonal changes in upwelling activity on the foraging locations of a wide-ranging central-place forager, the New Zealand fur seal*'. Canadian Journal of Zoology 86: 774-789.

Beaureu of Meteorology (BOM), 2021a. '*Climate statistics for Australian locations – Summary statistics Cape Otway Lighthouse*'. Available at: http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=090015&p_prim_element_index=0&p_comp_element_index=0&redraw=null&p_display_type=statistics_summary&normals_years=1991-2020&tablesizebutt=normal.

Beaureu of Meteorology (BOM), 2021b. '*Climate statistics for Australian locations – Summary statistics Portland (Cashmore Airport)*'. Available at: http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=090171&p_prim_element_index=0&p_comp_element_index=0&redraw=null&p_display_type=statistics_summary&normals_years=1991-2020&tablesizebutt=normal.

Beaureu of Meteorology (BOM), 2021c. '*Climate statistics for Australian locations – Summary statistics Robe*'. Available at: http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=026026&p_prim_element_index=0&p_comp_element_index=0&redraw=null&p_display_type=statistics_summary&normals_years=1991-2020&tablesizebutt=normal.

Beaureu of Meteorology (BOM), 2021d. '*Climate statistics for Australian locations – Summary statistics King Island Airport*'. Available at: http://www.bom.gov.au/climate/averages/tables/cw_098017.shtml.

Behler, J.L., Pritchard, P.C.H., Rhodin, A.G.L., 1996. '*The leatherback turtle, Dermochelys coriacea*'. Chelonian Conservation and Biology, 2: 139–319.

Bendell, A., 2011. '*Shafag Asiman Offshore Block 3D Seismic Survey Exploration Survey – Environmental Impact Assessment*'. Prepared for BP Azerbaijan, 23 August 2011. Reference No. P140167.

Benson, S.R., P.H., Dutton, C. Hitipeuw, B. Samer, J. Bakarbessy, D. Parker, 2007. '*Post-Nesting Migrations of Leatherback Turtles (Dermochelys coriacea) from Jamursba-Medi, Bird's Head Peninsula, Indonesia*'. Chelonian Conservation and Biology. 6(1):150-154. Chelonian Research Foundation. Available from: http://www.bioone.org/doi/pdf/10.2744/1071-8443%282007%296%5B150%3APMOLTD%5D2.0.CO%3B2.

Berra, T.M., 1982. '*Life history of the Australian grayling Prototroctes maraena (Salmoniformes: Prototroctidae) in the Tambo River, Victoria*'. Copeia, 1982(4):795-805.

Bertrand, A., Josse, E., 2000. '*Acoustic estimation of longline tuna abundance*'. ICES Journal of Marine Science, 57: 919 – 926.

Bestley, S., Gunn, J.S., Hindell, M.A., 2008. '*Feeding ecology of wild migratory tunas revealed by archival tag records of visceral warming*'. Journal Animal Ecology, 77: 1223 – 1233.

Bestley, S., Gunn, J.S., Hindell, M.A., 2009. '*Plasticity in vertical behaviour of migrating juvenile southern bluefin tuna (Thunnus maccoyii) in relation to oceanography of the south Indian Ocean*'. Fish Oceanography, 18: 237 – 254.

Bilgmann, K., Möller, L.M., Harcourt, R.G., Gibbs, S.E., Beheregaray, L.B., 2007. '*Genetic differentiation in bottlenose dolphins from South Australia: association with local oceanography and coastal geography*'. Marine Ecology Progress Series, 341: 265 – 276.

Birnell, O., Mayfield, S., Hogg, A., 2022. '*Status of the Southern Zone Abalone (Haliotis rubra and H. laevigata) Fishery in 2021/22.*' Report for PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2014/000359-5. SARDI Research Report Series No. 1138. 29pp.

Bizzigotti, G.O., Castelly, H., Hafez, A.M., Smith, W.H.B., Whitmire, M.T., 2009. '*Parameters for evaluation of the fate, transport, and environmental impacts of chemical agents in marine environments*'. Chem. Rev., 109(1): 236 – 256.

Bjeder, M., Johnston, D.W., Smith, J., Friedlaender, A., Bjeder, L., 2016. '*Embracing conservation success of recovering humpback whale populations: Evaluating the case for downlisting their conservation status in Australia*'. Marine Policy 66: 137-141.

Bjorndal, K.A., Bolten, A.B., Martins, H.R., 2000. '*Somatic growth model of juvenile loggerhead turtles Caretta caretta: duration of pelagic stage*'. Marine Ecology Progress Series, 202, 265 – 272.

Blackwell, S.B., Nations, C.S., McDonald, T.L., Thode, A.M., Mathias, D., Kim, K.H., Greene, C.R., Macrander, A.M., 2015. '*Effects of airgun sounds on bowhead whale calling rates: evidence for two behavioural thresholds*'. PLoS One. 10(6): doi: 10.1371/journal.pone.0125720.

Blair, H.B., Merchant, N.D., Friedlaender, A.S., Wiley, D.N., Parks, S.E., 2016. '*Evidence for ship noise impacts on humpback foraging behaviour*'. Biology Letters, 12: 20160005/.

Blue Whale Study Inc., 2023. http://bluewhalestudy.org/

Boeger, W.A., Pie, M.R., Ostrensky, A., Cardoso, M.F., 2006. '*The effect of exposure to seismic prospecting on coral reef fishes*'. Brazilian Journal of Oceanography 54(4):235-239

Bohne, B.A., Thomas, J.A., Yohe, E.R., Stone, S.H., 1985. '*Examination of potential hearing damage in Weddell Seals (Leptonychotes weddelli) in McMurdo Sound, Antarctica*'. Antarctic Journal of the United States, 20, pp.174-176.

Bolten, A., Winterington, B., 2003. '*Loggerhead sea turtles'*. Washington, Smithsonian Books.

Bone, C., 1998. *'Preliminary investigation into leatherback turtle, Dermochelys coriacea (L.) distribution, abundance and interactions with fisheries in Tasmanian waters'*. Unpublished Report.'. Tasmanian Parks and Wildlife Service.

Booman, C., Dalen, J., Leivestad, H., Levsen, A., van der Meeren, T. og Toklum, K. 1996. Effekter av luftkanonskyting på egg, larver og yngel. Undersøkelser ved Havforskningsinstituttet og Zoologisk Laboratorium, UiB. (Engelsk sammendrag og figurtekster). Havforskningsinstituttet, Bergen. Fisken og Havet nr. 3 (1996). 83 s.

Boreen, T.D., James, N.P., 1993. '*Holocene sediment dynamics on a cool water carbonate shelf: Otway, South-eastern Australia*'. J Sediment Petrol, 63(4), 574 – 588.

Boult, P.J., McKirdy, D.M., Blevin, J.E., Heggeland, R., Lang , S.C., Vinall, D.R., 2006. '*The Morum Sub-basin Petroleum System, Otway Basin, South Australia*'. Search and Discovery Article #10095.

Boustany, A, M., Matteson, R., Castleton, M., Farwell, C., Block, B.A., 2010. '*Movements of pacific bluefin tuna (Thunnus orientalis) in the Eastern North Pacific revealed with archival tags'*. Prog. Oceanography, 8: 94 – 104.

Bowles, A.E., Smultea, M., Würsig, B., DeMaster, D.P., Palka, D., 1994. '*Relative abundance and behaviour of marine mammals exposed to transmissions from the Heard Island Feasibility Test'*. Journal of the Acoustical Society of America 96, 2469–2484.

Bradford, R., Patterson, T.A., Rogers, P.J., McAuley, R., Mountsford, S., Huveneers, C., Robbins, R., Fox, A., Bruce, B.D., 2020. '*Evidence of diverse movement strategies and habitat use by white sharks, Carcharodon carcharias, off southern Australia*'. Marine Biology, 167: 96.

Branch, T.A., Stafford, K.M., Palacios, D.M., Allision, C., Bannister, J.L., Burton, C.L.K., Cabrera, E., Carlson, C.A., Galletti Vernazzani, B., Gill, P.C., Hucke-Gaete, R., Jenner, K.C.S., Jenner, M-N.M., Matsuoka, K., Mikhalev, Y.A., Miyashita, T., Morrice, M.G., Nishiwaki, S., Sturrock, V.J., Tormosov, D., Anderson, R.C., Baker, A.N., Best, P.B., Borsa, P., Brownell Jr, R.L., Childerhouse, S., Findlay, K.P., Gerrodette, T., Ilangakoon, A.D., Joergensen, M., Kahn, B., Ljunglad, D.K., Maughan, B., McCauley, R.D., McKay, S., Norris, T.F., Oman Whale and Dolphin Research Group, Rankin, S., Samaran, F., Thiele, D., Van Waerbeek, K., Warneke, R.M., 2007. '*Past and present distribution, densities and movements of blue whales Balaenoptera musuclus in the Southern Hemisphere and northern Indian Ocean*'. Mammal Rev., 37(2): 116 – 175.

Brandão, A., Best, P.B., Butterworth, D.S., 2011. '*Monitoring the recovery of the southern right whale in South African waters*'. International Whaling Commission Document SC/S11/RW18.

Braun, C.B., Grande, T., 2008. '*Evolution of peripheral mechanisms for the enhancement of sound reception*'. pp. 99–144 in Webb, J.F., Fay, R.R. and Popper, A.N. (eds.) Fish bioacoustics. Springer, New York, USA.

Bray, D.J., Gomon, M.F., 2011. '*Blue warehou, Seriolella brama'*. In: Taxonomic Toolkit for Marine Life of Port Philip Bay. Museum Victoria.

Broker, K., 2019. '*An overview of potential impacts of hydrocarbon exploration and production on marine mammals and associated monitoring and mitigation measures'*. Aquatic Mammals 2019, 45(6), 576-611, DOI 10.1578/AM.45.6.2019.576.

Bruce, B., Bradford, R., Foster, S., Lee, K., Lansdell, M., Cooper, S., Przeslawski, R., 2018. '*Quantifying fish behaviour and commercial catch rates in relation to a marine seismic survey'*. Marine Environmental Research, DOI:10.1016/j.marenvres.2018.05.005.

Bruce, B.D., 2008. '*The Biology and Ecology of the White Shark, Carcharodon carcharias*'. In: Camhi, M.D, E.K. Pikitch and E.A Babcock, eds. Sharks of the Open Ocean. Page(s) 69-76. Oxford, UK: Blackwell Publishing.

Bruce, B.D., Green, M.A., Last, P.R., 1998. '*Threatened Fishes of the World: Brachionichthys hirsutus (Lacepede, 1804) (Brachionichthyidae)*'. Environmental Biology of Fishes, 52:418.

Bruce, B.D., Neira, F.J., Bradford, R.W., 2001. '*Larval distribution and abundance of blue and spotted warehous (Seriolella brama and S. punctata: Centrolophidae) in south-eastern Australia*'. Marine and Freshwater Research, vol. 52: 631 – 636.

Brumm, H., Slabbekoorn, H., 2005. '*Acoustic communication in noise'*. Adv. Study. Behav., 35:151-209.

Bulman, C., Condie, S., Findlay, J., Hender, J., Ward, B., Young, J., 2008. '*Management zones from small pelagic fish species stock structure in southern Australian waters'*. FRDC project, (2006/076).

Bulman, C., Sporcic, M., Fuller, M., 2020. '*Ecological Risk Assessment for Effects of Fishing. Report for the Southern Bluefin Tuna Fishery: Purse Seine Sub-Fishery 2015-2019'*. Report for the Australian Fisheries Management Authority. December 2020

Burnell, S.R. 1999. '*The Population Biology of Southern Right Whales in Southern Australian Waters'*. PhD, University of Sydney.

Burnell, S.R., 2001. '*Aspects of the reproductive biology, movements and site fidelity of right whales off Australia*'. Journal of Cetacean Research and Management (Special Issue) 2: 89-102.

Burnell, S.R., Bryden, M.M., 1997. '*Coastal residence periods and reproductive timing in southern right whales, Eubalaena australi*s'. Journal of Zoology, 241: 613 – 621.

Butler, A., Althaus, F., Furlani, D., Ridgway, K., 2002b. '*Assessment of the conservation values of the Bonney Upwelling: a component of the Commonwealth Marine Conservation Assessment Program 2002-2004'*. Report to Environment Australia.

Butler, A., Harris, P., Lyne, V., Heap, A., Passlow, V., Porter-Smith, R., 2001. '*An Interim Bioregionalisation for the continental slope and deeper waters of the South-East Marine Region of Australia*'. Report to the National Oceans Office, Geoscience Australia and CSIRO, Hobart.

Butler, A.J., Althaus, F., Furlani, D.M., Ridgway, K.R., 2002a. '*Assessment of the conservation values of the Bass Strait sponge beds area: a component of the Commonwealth Marine Conservation Assessment Program 2002-2004'*. Report to Environment Australia.

Byrnes, T.A., Dunna, R.J.K., 2020. '*Boating- and Shipping-related Environmental Impacts and Example Management Measures: a Review'*. Journal of Marine Science and Engineering, 8, 908.

Campbell, R.A., 2003. '*Demography and genetic population structure of the Australian sea* lion (Neophoca cinerea)'. Ph.D. Thesis. Department of Zoology, University of Western Australia.

Carey, W.M., 2009. '*Lloyd's Mirror-Image Interference Effects'*. Acoustics Today, 5(2):14-20.

Carroll, A. G., Przeslawski, R., Duncan, A., Gunning, M., Bruce, B., 2017. '*A critical review of the potential impacts of marine seismic surveys on fish & invertebrates*'. Marine pollution bulletin, 114(1), 9-24.

Carroll, E., Patenaude, N., Alexander, A., Steel, D., Harcourt, R., Childerhouse, S., Smith, S., Bannister, J., Constantine R, Scott Baker, C., 2011. '*Population structure and individual movement of southern right whales around New Zealand and Australia'*. Marine Ecology Progress Series. 432:257-68

Carroll, E.L., Baker, C.S., Watson, M., Alderman, R., Bannister, J., Gaggiotti, O.E., Grocke, D.R., Patenaude, N., Harcourt, R., 2015. '*Cultural traditions across a migratory network shape the genetic structure of southern right whales around Australia and New Zealand*'. Scientific Reports, 5: 16182, DOI:10.1038/srep161682.

Carroll, E.L., Rayment, W.J., Alexander, A.M., Baker, S.C., Patenause, N.J., Steel, D., Constantine, R., Cole, R., Boren, L.J., Childerhouse, S., 2014. '*Reestablishment of former wintering ground by New Zealand southern right whales'*. Marine Mammal Science.

Casper, B.M., Halvorsen, M.B., Popper, A.N., 2012. '*Are sharks even bothered by a noisy environment?'*. In Popper, A.N., Hawkins, A., (Eds), The effects of noise on aquatic life, Advances in Experimental Medicine and Biology 730, DOI:10.1007/978-1-4419-7311-5_20.

Castellote, M., Clark, C.W., Lammers, M.O., 2012. '*Acoustic and behavioural changes by fin whales (Balaenoptera physalus) in response to shipping and airgun noise'*. Biological Conservation, 147(1): 115 – 122.

Castro, J.I., Woodley, C.M., Brudek, R.L., 1999. '*A preliminary evaluation of the status of shark species*'. FAO Fisheries Technical Paper 380. FAO, Rome.

Cato, D.H., McCauley, R.D., 2002. 'Australian research into ambient sea noise'. Journal of Australian Acoustics, 30(1):13-20.

Caton, A.E., 1991. '*Review of aspects of southern bluefin tuna biology, population and fisheries'*. In: World Meeting on Stock Assessment of Bluefin Tuna: Strengths and Weaknesses, Deriso, R,B,m Bayliff, W.H. (Eds). IATTC, La Jolla, CA, Special Report 7, pp. 181 – 357.

Celi, M., Filiciotto, F., Parrinello, D., Buscaino, G., Damiano, M. A., Cuttitta, A., D'Angelo, S., Mazzola, S., and Vazzana, M. 2013. '*Physiological and agonistic behavioural response of Procambarus clarkii to an acoustic stimulus'.* Journal of Experimental Biology 216, 709-718.

Cerchio, S., Stindberg, S., Collins, T., Bennett, C., Rosenbaum, H., 2014. '*Seismic surveys negatively affect humpback whales singing activity off northern Angola*'. PLoS ONE, 9(3): e86464, doi:10.1371/journal.pone.0086464.

Chapman, C., Hawkins, A., 1969. '*The importance of sound in fish behaviour in relation to capture by trawls*'. Fisheries and Aquaculture Report 62 (3): 717–729.

Charlton, C., McCauley, R.D., Brownell Jr, R.L., Ward, R., Bannister, J.L., Salgado Kent, C. & Burnell, S. 2022. '*Southern Right Whale (Eubalaena Australis) Population Demographics at Major Calving Ground Head of Bight, South Australia, 1991–2016*'. Aquatic Conservation: Marine and Freshwater Ecosystems 32, 4, 671-686. doi: https://doi.org/10.1002/aqc.3771.

Charlton, C., Ward, R., McCauley, R.D., Brownell Jr, R.L., Salgado Kent, S., Burnell, S., 2019. '*Southern right whale (Eubalaena australis), seasonal abundance and distribution at Head of Bight, South Australia*'. Aquatic Conservation: Marine and Freshwater Ecosystems, 29: 576 – 588.

Charlton, C.M., 2017. '*Population demographics of southern right whales (Eubalaena australis) in southern Australia*'. Ph.D. thesis. Curtin University, Centre for Marine Science and Technology, Perth, Australia. 171 pp.

Charlton-Robb, K., Gershwin, L-a., Thompson, R., Austin, J., Owen, K., 2011. '*A New Dolphin Species, the Burrunan Dolphin Tursiops australis sp. nov., Endemic to Southern Australian Coastal Waters*'. PLoS ONE 6(9): e24047. doi:10.1371/journal.pone.0024047

Childerhouse, S., Double, M. and Gales, N. 2010. '*Satellite Tracking of Southern Right Whales (Eubalaena Australis) at the Auckland Islands, New Zealand*'. Report to the International Whaling Commission document SC/62/BRG19.

Chilvers, B.L, Goldsworthy, S.D., 2015. *Arctocephalus forsteri*. The IUCN Red List of Threatened Species.

Chittleborough, R.G., 1965. '*Dynamics of two populations of the humpback whale, Megaptera novaeangliae (Borowski)*'. Australian Journal of Marine and Freshwater Research 16: 33-128.

Chou, E., Southall, B., Robards, M., Rosenbaum, H., 2021. '*International policy, recommendations, actions, and mitigation efforts of anthropogenic underwater noise'*. Ocean and Coastal Management202: 105427.

Christian, J.R., Mathieu, A., Thompson, D.H., White, D., Buchanan, R., 2003. *'Effect of Seismic Energy on Snow Crab (Chionoecetes opilio)'*. Report No. SA694 to the Canadian National Energy Board (Calgary, Alberta) by LGL Ltd (King City, Ontario) and Oceans Ltd (St John's, Newfoundland). 106 pp.

Ciannelli, L., Bailey, K., Olsen, E.M., 2015. '*Evolutionary and ecological constraints of fish spawning habitats*'. ICES Journal of Marine Science, 72(2): 285 – 296.

Cirano, M., Middleton, J.F., 2003. '*Aspects of the mean wintertime circulation along Australia's southern shelves: numerical studies*'. Journal of Physical Oceanography, 34: 668 – 684.

Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., Ponirakis, D., 2009. '*Acoustic masking in marine ecosystems: intuitions, analysis, and implications*'. Marine Ecology Progress Series, 395: 201 – 222.

CoA (Commonwealth of Australia). 2022. '*Draft National Recovery Plan for the Southern Right Whale Eubalaena australis*'. Published by the Department of Climate Change, Energy, the Environment and Water, Canberra, Australia.

Colgan, D.J., Paxton, J.R., 1997. '*Biochemical genetics and recognition of a western stock of the common gemfish, Rexea solandri (Scombroidea: Gempylidae), in Australia*'. Marine and Freshwater Research, 48:103-118.

Collette, B., Chang, S.K., Di Natale, A., Fox, W., Juan Jorda, M., Miyabe, N., Nelson, R., Uozumi, Y., Wang, S., 2011. *Thunnus maccoyii*. The IUCN Red List of Threatened Species 2011: e.T21858A9328286. http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T21858A9328286.en

Collins, M., Cullen, J. M., Dann, P., 1999. '*Seasonal and annual foraging movements of little penguins from Phillip Island Victoria*'. Wildlife Research 26: 705-721.

Colman, J. G., Grebe, C. C., Hearn, R. L., 2008. '*The challenges and complexities of impact assessment for a seismic survey in a remote coral reef environment*'. IAIA08 Conference Proceedings, The Art and Science of Impact Assessments 28th Conference of the International Association for Impact Assessments, 4 – 10 May 2008, Perth Convention Exhibition Centre, Perth, Australia.

Commission for the Conservation of Southern Bluefin Tuna (CCSBT), 2009. '*Report of the Extended Commission of the Sixteenth Annual Meeting of the Commission*'. 20-23 October 2009, Republic of Korea. CCSBT.

Commonwealth of Australia (CoA), 2012. '*Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999. 2011-2021*'. Australian Government, Department of Sustainability, Environment, Water, Population and Communities.

Commonwealth of Australia (CoA), 2013. '*Recovery Plan for the Australian sea lion (Neophoca cinerea)'.* Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Commonwealth of Australia (CoA), 2013a. '*Recovery plan for the white shark (Carcharodon carcharias). Commonwealth of Australia, 2013*'. Australian Government, Department of Sustainability, Environment, Water, Population and Communies.

Commonwealth of Australia (CoA), 2015. '*South-east marine region profile: a description of the ecosystems, conservation values and uses of South-east Marine Region*'. 88p.

Commonwealth of Australia (CoA), 2020a. '*Australian Ballast Water Management Requirements*'. Version 8, Department of Agriculture Water and the Environment.

Commonwealth of Australia, 2015a. '*Conservation Management Plan for the blue whale – a Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999*'. 57pp.

Commonwealth of Australia, 2017a. '*Recovery plan for Marine Turtles in Australia: 2017 – 2027*'. 154pp.

Commonwealth of Australia, 2017b. '*National strategy for reducing vessel strike on cetaceans and other marine megafauna*'. 35pp.

Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2001. '*Marine Research. Rapid assembly of ecological fish data (community composition and distribution) for the south-east marine region: report commissioned by National Oceans Office*'. Hobart, Tas.: CSIRO Marine Research; 2001-11. https://doi.org/10.4225/08/596e5af8949af

Compagno, L.J.V., 1984. FAO species catalogue. '*Sharks of the world. An annotated and illustrated catalogue of shark species known to date*'. FAO Fisheries Synopsis No. 125, Volume 4, Part 1.

ConocoPhillips, 2021. '*Sequoia 3D Marine Seismic Survey Environmental Plan*'. Report No. ABU2-000-EN-V01-D-00001. Dated 5 August 2021. Available online at: https://docs.nopsema.gov.au/A795860

Conservation Values Atlas, 2023. '*Conservation Values Atlas*'. http://www.environment.gov.au/topics/marine/marine-bioregional-plans/conservation-values-atlas

Cote, D., Morris, C.J., Regular, P.M., Piersiak, M.G., 2020. '*Effects of 2D seismic on snow crab movement behaviour*'. Fisheries Research, 230: 105661.

Cresswell, G.R., Domingues, C.M., 2009. '*The Leeuwin Current south of Western Australia*'. Journal of the Royal Society of Western Australia, 92: 83 – 100.

Cudahy, E., Parvin, S., 2001. '*The effects of underwater blast on divers*'. Naval Submarine Medical Research Laboratory, NSMRL Report 1218, 64p.

Culik, B., 2005. '*Pseudorca crassidens. Review on Small Cetaceans: Distribution, Behaviour, Migration and Threats*'. Compiled for the Convention on Migratory species (CMS).

Cummings, W.C., Thompson, P.O., 1971. '*Underwater sounds from the blue whale, Balaenoptera musculus*'. Journal of the Acoustical Society of America 50: 1193-1198.

Cusano, D.A., Conger, L.A., Van Parijs, S.M., Parks, S.E., 2019. '*Implementing conservation measures for the North Atlantic right whale, considering the behavioural ontogeny of mother-calf pairs*'. Animal Conservation, 22(3): 228 – 237.

Czub, M., Nawala, J., Popiel, S., Dziedzic, D., Brzezinski, T., Maszczyzk, P., Sanderson, H., Fabisiak, J., Beldowski, J., Kotwicki, L., 2020. '*Acute aquatic toxicity of sulfur mustard and its degradation products to Daphnia magna*'. Marine Environmental Research, 161. DOI: 10.1016/j.marenvres.2020.105077.

Dale, J.J., Gray, M.D., Popper, A.N., Rogers, P.H., Block, B.A., 2015. '*Hearing thresholds of swimming Pacific bluefin tuna Thunnus orientalis*'. J. Comp. Physiol. A., 201: 441 – 454.

Daley, R.K., Stevens, J.D., Graham, K.J., 2002. '*Catch analysis and productivity if the deepwater dogfish resource in southern Australia*'. FRDC Final Report 1998/108. CSIRO Marine Research, Fisheries Research & Development Cooperation and NSW Fisheries, Australia.

Daume, S., Gardner, C., Leporati, S., Trott, P., 2016. '*Western Australia Abalone Fishery: MSC Full Assessment*'. Public Comment Draft Report. Sustainable Seafood Program – Australia & NZ.

David, A., 2011. '*Underwater environmental impact assessments on marine mammals and fish by high power anthropogenic radiated sound*'. Paper Number 27, Proceedings of Acoustics. 2-4 November 2011, Gold Coast, Australia. https://acoustics.asn.au/conference_proceedings/AAS2011/papers/p27.pdf.

Davidsen, J.G., Dong, H., Linné, M., Andersson, M.H., Piper, A., Prystay, T.S., Hvam, E.B., Thorstad, E.B., Whoriskey, F., Cooke, S.J., Sjursen, A.D., 2019. '*Effects of sound exposure from a seismic airgun on heart rate, acceleration and depth use in free-swimming Atlantic cod and saithe*'. Conservation physiology, 7(1), p.coz020.

Dawbin, W.H., 1966. '*The seasonal migratory cycle or humpback whales*'. In: Norris, K.S. (eds). Whales, Dolphins and Porpoises. University of California Press, Berkley. Pp 145-170.

Dawbin, W.H., 1986. '*Right whales caught in waters around south eastern Australia and New Zealand during the nineteenth and early twentieth centuries*'. Report of the International Whaling Commission, 10, pp.261-7.

Dawbin, W.H., Cato, D.H., 1992. '*Sounds of a pygmy right whale (Caperea marginata)*'. Marine Mammal Science, 8(3): 213 – 219

Day, R.D., Fitzgibbon, Q.P., McCauley, R.D., Baker, K.B., Semmens, J.M., 2022. '*The impact of seismic survey exposure on the righting reflex and moult cycle of Southern Rock Lobster (Jasus edwardsii) puerulus larvae and juveniles*'. Environmental Pollution, 309, p.119699.

Day, R.D., Fitzgibbon, Q.P., McCauley, R.D., Semmens, J.M., 2021. *'The Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania. Examining the potential impacts of seismic surveys on Octopus and larval stages of Southern Rock Lobster - PART A: Southern Rock Lobster*'. FRDC project 2019-051. 2021.

Day, R.D., McCauley, R.D., Fitzgibbon, Q.P., Hartmann, K., Semmens, J.M., 2019. '*Seismic air guns damage rock lobster mechanosensory organs and impair righting reflex*'. Proceedings of the Royal Society B, 286(1907), p.20191424.

Day, R.D., McCauley, R.D., Fitzgibbon, Q.P., Semmens, J.M., 2016a. '*Seismic air gun exposure during early-stage embryonic development does not negatively affect spiny lobster Jasus edwardsii larvae (Decapoda: Palinuridae)*'. Scientific Reports 6:22723.

Day, R.D., McCauley, R.M., Fitzgibbon, Q.P., Hartmann, K., Semmens, J.M., 2017. '*Exposure to seismic air gun signals causes physiological harm and alters behavior in the scallop Pecten fumatus*'. Proceedings of the National Academy of Science of the United States of America, October 2017, 114 (40) E8537-E8546; DOI: 10.1073/pnas.1700564114

Day, R.D., McCauley, R.M., Fitzgibbon, Q.P., Semmens, J.M., 2016b. '*Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries*'. FRDC Project No 2012/008. University of Tasmania, Hobart, Tasmania.

De Jong, K., Forland, T.N., Amorim, M.C.P., Rieucau, G., Slabekoorn, H., Doksæter Sivle, L., 2020. '*Predicting the effects of anthropogenic noise on fish reproduction*'. Rev Fish Biol Fisheries, 30: 245 – 268.

Deecke, V.B., Ford, J.K.B., Spong, P., 2000. '*Dialect change in resident killer whales: implications for vocal learning and cultural transmission*'. Animal Behaviour, 60: 629 – 638.

Deng, X., Hwang, C., Coleman, R., Featherstone, W.E., 2008. '*Seasonal and interannual variations of the Leeuwin Current off Western Australia from TOPEX/Poseidon Satellite Altimetry*'. Terr. Atmos. Ocean. Sci., 19(1-2): 135 – 149.

Department of Agriculture, Water and the Environment, 2021. '*Assessment of the Victorian PQ Aquatics Syngnathids Wildlife Trade Operation'*. https://www.dcceew.gov.au/sites/default/files/documents/vic-pq-aquatics-assessment-2021.pdf

Department of Climate Change, Energy, the Environment and Water (DoCCEEW), 2012. Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia. Accessed may 2023, available at: https://www.environment.gov.au/biodiversity/threatened/communities/pubs/107-conservation-advice.pdf

Department of Climate Change, Energy, the Environment and Water (DoCCEEW), 2023. '*Species Profile and Threats Database'*. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Defence, 2018. '*Commonwealth policy on the management of land in Australia affected by unexploded ordnance'*. https://uxo.defence.gov.au/sites/default/files/2023-02/commonwealth_policy_on_the_management_of_land_affected_by_unexploded_ordnance_1_feb_2018.pdf

Department of Primary Industries and Regions (PIRSA), 2011. '*Management Plan for the South Australian Charter Boat Fishery*'. The South Australian Fisheries Management Series Paper 56, 66p. Primary Industries and Regions South Australia.

Department of Primary Industries and Regions (PIRSA), 2012. '*Management Plan for the South Australian Commercial Abalone Fishery*'. The South Australian Fisheries Management Series, Paper No 60, Primary Industries and Resources South Australia, 89p, Primary Industries and Regions South Australia.

Department of Primary Industries and Regions (PIRSA), 2012. '*Management Plan for the South Australian Commercial Abalone Fishery, The South Australian Fisheries Management Series'*. Paper No 60, Primary Industries and Resources South Australia, 89p, Primary Industries and Regions South Australia.

Department of Primary Industries and Regions (PIRSA), 2021. '*Commercial Fisheries'*. https://pir.sa.gov.au/primary_industry/commercial_fishing/commercial_fisheries

Department of Primary Industries and Regions (PIRSA), 2022. '*Recreational Fishing Rules*'. Government of South Australia. Available at: https://www.pir.sa.gov.au/recreational_fishing/rules

Department of Primary Industries, Parks, Water and Environment, 2018. '*Tasmanian Abalone Fishery. Sustainable Harvest Strategy*'. https://fishing.tas.gov.au/Documents/Abalone%20Harvest%20Strategy.pdf

Department of Primary Industries, Water and Environment (DPIWE), 2002. '*Draft Spotted Handfish Recovery Plan*'. Department of Primary Industries, Water and Environment, Hobart, Australia

Department of the Environment (DoE), 2014. '*Recovery plan for the grey nurse shark (Carcharias taurus)*'. 48p..

Department of the Environment and Heritage (DEH), 2005. '*Blue, fin and sei whale recovery plan 2005-2010*'. Commonwealth of Australia, 2005.

Di lorio, L., Clark, C.W., 2010. '*Exposure to seismic survey alters blue whale acoustic communication'*. Biol. Lett. 6: 51 – 54.

Director of National Parks (DNP), 2013. '*South-east Commonwealth Marine Reserves Network management plan 2013-23*'. Director of National Parks, Canberra.

Director of National Parks (DNP), 2018. '*South-west Marine Parks Network Management Plan 2018'*. 186p.

Discover Tasmania, 2023a. '*Diving*'. https://www.discovertasmania.com.au/what-to-do/outdoors-and-adventure/diving

Discover Tasmania, 2023b. '*Surfing*'. https://www.discovertasmania.com.au/what-to-do/outdoors-and-adventure/surfing

DNRET, 2023. '*About the department'*. https://nre.tas.gov.au/about-the-department

DNV, 2011. '*Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters*'. Prepared for Australian Maritime Safety Authority, Report No. PP002916.

DoAWR (Department of Agriculture and Water Resources), 2002. '*National Competition Policy Review of Commonwealth Fisheries Legislation*'. Available at: http://www.agriculture.gov.au/fisheries/domestic/review-comm-fishleg.

DoAWR, 2023. '*Department of Agriculture and Water Resources – The Australian Fishing Zone'*. http://www.agriculture.gov.au/fisheries/domestic/zone, accessed March 2022.

DoEE, 2012. '*Key Threatening Process Nomination Form – 2012 Assessment Period*'. https://www.environment.gov.au/system/files/pages/87ef6ac7-da62-4a45-90ec-0d473863f3e6/files/nomination-marine-seismic.pdf

Dombroski, J.R., Parks, S.E., Nowacek, D.P., 2021. '*Dive behaviour of North Atlantic right whales on the calving ground in the Southeast USA: implications for conservation*'. Endangered Species Research, 46: 35 – 48.

Dooling, R.J., Leek, M.R., 2018. '*Communication masking by man-made noise*'. In Slabbekoorn, H., Dooling, R.J., Popper, A.N., Fay, R.R. (Eds), Effects of anthropogenic noise on animals. Springer Handbook of Auditory Research 66, pp. 23 – 46.

Double, M.C, Andrews-Goff, V., Jenner, K.C.S., Jenner, M-N., Laverick, S.M., Branch, T.A., Gales, N.J., 2014. '*Migratory movements of pygmy blue whales (Balaenoptera musculus brevicauda) between Australia and Indonesia as revealed by satellite telemetry*'. PLoS One 9:9(4):e93578.

DpaW, 2013. '*Whale shark management with particular reference to Ningaloo Marine Park, Wildlife management program no. 57*'. Department of Parks and Wildlife, Perth, Western Australia.

DSEWPaC, 2012. '*Conservation management plan for the southern right whale. A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999 2011 – 2021*'. Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT.

Dubovskaya, O.P., Tang, K.W., Gladyshev, M.I., Kirillin, G., Buseva, Z., Kasprzak, P., Tolomeev, A.P., Grossart, H-P. 2015. '*Estimating in situ zooplankton non-predation mortality in an oligo-mesotrophic lake from sediment trap data: caveats and reality check*'. PLoS ONE 10(7): e0131431.

Duncan, A.J. 2016. '*Estimated received sound levels at the seafloor beneath seismic surveys*.' Proceedings of Acoustics 2016 Conference. 9-11 November 2016. Brisbane Australia

Dunlop, R.A., Cato, D.H., Noad, M.J., 2010. '*Your attention please: increasing ambient noise levels elicits a change in communication behaviour in humpback whales (Megaptera novaeangliae*)'. Proc. R. Soc. London, Ser. B, 277: 2521 – 2529.

Dunlop, R.A., Cato, D.H., Noad, M.J., 2014. '*Evidence of a Lombard response in migrating humpback whales (Megaptera novaeangliae)*'. J. Acoust. Soc. Am. 136, 430–437. (doi:10.1121/1.4883598)

Dunlop, R.A., Cato, D.H., Noad, M.J., Stokes, D.M., 2013. '*Source levels of social sounds in migrating humpback whales (Megaptera novaeangliae)*'. Journal of the Acoustical Society of America, 134(1): 706 – 714.

Dunlop, R.A., Noad, M.J., Cato, D.H., Stokes, D., 2007. '*The social vocalization repertoire of east Australian migrating humpback whales (Megaptera novaeangliae)*'. Journal of the Acoustical Society of America, 122(5): 2893 – 2905.

Dunlop, R.A., Noad, M.J., McCauley, R.D., Kniest, E., Paton, D., Cato, D.H., 2015. '*The behavioural response of humpback whales (Megaptera novaeangliae) to a 20 cubic inch air gun*'. Aquatic Mammals, 41(4): 412 – 433.

Dunlop, R.A., Noad, M.J., McCauley, R.D., Kniest, E., Slade, R., Paton, D., Cato, D.H., 2016. '*Response of humpback whales (Megaptera novaeangliae) to ramp-up of a small experimental air gun array*'. Marine Pollution Bulletin, 103: 72 – 83.

Dunlop, R.A., Noad, M.J., McCauley, R.D., Scott-Hayward, L., Kniest, E., Slade, R., Paton, D., Cato, D.H., 2017. '*Determining the behavioural dose–response relationship of marine mammals to air gun noise and source proximity*'. Journal of Experimental Biology, 220:2878-2886

Durante, L.M., Smart, J.J., Tsolos, A., 2022. '*South Australian Charter Boat Fishery 2020/21*'. Final report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000847-6. SARDI Research Report Series No. 1130, 47pp.

Dyndo, M., Wisniewska, D.M., Rojano-Donate, L., Madsen, P.T., 2015. '*Harbour porpoises react to low levels of high frequency vessel noise*'. Scientific Reports, 5: 11083, DOI:10/1038/srep11083.

Eastern Maar Aboriginal Corporation, 2020. 'About'. https://easternmaar.com.au/about/

Edmonds, N.J., Firmin, C.J., Goldsmith, D., Faulkner, R.C., Wood, D.T., 2016. '*A review of crustacean sensitivity to high amplitude underwater noise: data needs for effective risk assessment in relation to UK commercial species*'. Marine Pollution Bulletin, 108: 5–11.

Elwen, S.H. & Best, P.B. 2004. '*Environmental Factors Influencing the Distribution of Southern Right Whales (Eubalaena Australis) on the South Coast of South Africa Ii*' Within Bay Distribution Marine Mammal Science 20, 3, 583-601. doi: https://doi.org/10.1111/j.1748-7692.2004.tb01181.x.

Emery, T., 2021. '*Orange Roughy (2020)*' . Available at https://fish.gov.au/report/318-Orange-Roughy-2020

Engås, A., Løkkeborg, S., 2002. '*Effects of seismic shooting and vessel-generated noise on fish behaviour and catch rates*'. Bioacoustics 12(2-3): 313–316.

Engås, A., Løkkeborg, S., Ona, E., Soldal, A.V., 1996. '*Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock* (*Melanogrammus aeglefinus)'.* Canadian Journal of Fisheries and Aquatic Sciences 53(10):2238-2249.

Ensor, P., Sekiguchi, K., Cotton, J., Hucke-Gaete, R., Kariya, T., Komiya, H., Ljungblad, D., Marite, H., Olson, P., Rankin, S., 2002. *'2001-2002 IWC-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Circumpolar Cruises, Area V'*. Available from the IWC secretariat. Cambridge, UK – unpublished (as cited in the EPBC Act Conservation Advice)

Environmental and Natural Resources Committee (ENRC), 2002. '*Inquiry into the management of the fishing charter industry Victoria*'. Report. October 2002. State of Victoria

Erbe, C., 2002. '*Hearing abilities of baleen wha*les'. Defence R&D Canada, Contract Number" W7707-01-0828, 40p.

Erbe, C., Dunlop, R., Dolman, S., 2018. '*Effects of noise on marine mammals*'. In: Effects of Anthropogenic Noise on Animals Eds: Slabbekoorn, H., Dooling, R., Popper, A., Fay, R. (eds). Springer Handbook of Auditory Research. Chapter 10.

Erbe, C., McCauley, R., Gavrilov, A., Madhusudhana, S., Verma, A., 2016b. '*The underwater soundscape around Australia*'. Proceedings of ACOUSTICS 2016. 9-11 November 2016, Brisbane, Australia.

Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., Dooling, R., 2016a. '*Communication masking in marine mammals: a review and research strategy*'. Marine Pollution Bulletin, 103(2016): 15-38.

Erbe, C., Verma, A., McCauley, R., Gavrilov, A., Parnum, I., 2015. '*The marine soundscape of the Perth Canyon*'. Progress in Oceanography 137(Part A): 38-51.

Evans, K, Rogers, P., Goldsworthy, S., 2017. '*Theme 4: Ecology of an iconic species and apex predators*'. Theme Report, Great Australian Bight Research program, GABRP Research Report Series Number 37, 19pp

Evans, K., Bax, N., Smith, D.C., 2017. '*Australia state of the environment: marine environment*'. Independent report to the Australian Government Minister for the Environment and Energy, Australian Government Department of the Environment and Energy, Canberra, 238p.

Evans, K., Patterson, T., Eveson, P., Hobday, A., Lansdell, M., Cooper, S., davies, C., 2017a. '*Southern bluefin tuna: spatial dynamics and potential impacts of noise associated with oil and gas exploration*'. Final Report GABRP Project 4.3. Great Australian Bight Research Program, GABRP Research Report Series Number 18, 96pp.

Eveson, P., Farley, J., 2016. '*The aerial survey index of abundance: 2016 updated results'.* Working Paper CCSBT-ESC/1609/09 prepared for the twenty first CCSBT Extended Scientific Committee meeting, 5-10 September, Kaohsiun, Taiwan.

Eveson, P., Farley, J., Bravington, J., 2014. '*The aerial survey index of abundance: updated analysis methods and results for 2013 – 14 fishing season*'. CCSBT-ESC/1409/18, Auckland, New Zealand.

Fay, R.R., Popper, A.N., 2000. '*Evolution of hearing in vertebrates: the inner ears and processing*'. Hearing Research, 149:1-10.

Fay, R.R., Simmons, A.M., 1998. '*The sense of hearing in fish and amphibians*'. pp. 269–318 in Fay, R.R. and Popper, A.N. (eds.), Comparative hearing: fish and amphibians. Springer, New York, USA

Feary, D.A., Hine, A.C., Malone, M.J., et al, 2000. '*Proceesings of the Ocean Drilling Program, Initial Reports.*' Volume 182.

Fewtrell, J.L., 2003. '*The response of marine finfish and invertebrates to seismic survey noise*' (Doctoral dissertation, Curtin University).

Fewtrell, J.L., McCauley, R.D., 2012. '*Impact of air gun noise on the behaviour of marine fish and squid*'. Marine pollution bulletin, 64(5), pp.984-993.

Fields, D.M., Handegard, N.O., Dalen, J., Eichner, C., Malde, K., Karlsen, Ø., Skiftesvik, A.B., Durif, C.M., Browman, H.I., 2019. '*Airgun blasts used in marine seismic surveys have limited effects on mortality, and no sublethal effects on behaviour or gene expression, in the copepod Calanus finmarchicus'*. ICES Journal of Marine Science, 76(7), pp.2033-2044.

Filby, N.E., Bossley, M., Sanderson, K.J., Martinez, E., Stockin, K.A., 2010. '*Distribution and population demographics of common dolphins (Delphinus delphis) in the Gulf St. Vincent, South Australia*'. Aquatic Mammals, 36(1): 33 – 45.

Fine, M.L., Thorsen, R.F., 2008. '*Use of passive acoustics for assessing behavioural interactions in individual toadfish'.* Transactions of the American Fisheries Society, 137: 62 7 – 637.

Finneran, J., Henderson, E., Houser, D., Jenkins, K., Kotecki, S., Mulsow, J., 2017. '*Criteria and thresholds for U.S. navy acoustic and explosive effects analysis (phase III)*'. Department of Navy, San Diego, California, USA. 183 pp.

Finneran, J.J., 2015. '*Noise-induced hearing loss in marine mammals: A review of temporary threshold shift studies from 1996 to 2015'*. Journal of the Acoustical Society of America138: 1702-1726.

Finneran, J.J., 2016. '*Auditory weighting functions and TTS/PTS exposure functions for marine mammals exposed to underwater noise'*. Technical Report. Space and Naval Warfare Systems Center Pacific, San Diego, USA.

Finneran, J.J., Carder, D.A., Schlundt, C.E., Dear, R.L., 2010. '*Temporary threshold shift in a bottlenose dolphin (Tursiops truncatus) exposed to intermittent tones*'. J. Acoust. Soc. Am. 127, 3267-3272.

Finneran, J.J., Hastings, M.C., 2000. '*A mathematical analysis of the peripheral auditory system mechanics in the goldfish (Carassius auratus)*'. Journal of the Acoustical Society of America 108(3): 3035–3043.

Finneran, J.J., Jenkins, A.K., 2012. '*Criteria and thresholds for US Navy acoustic and explosive effects analysis'*. Technical report prepared for SSC Pacific, April 2012. Available online at: https://apps.dtic.mil/sti/pdfs/ADA561707.pdf.

Finneran, J.J., Schlundt, C.E., Branstetter, B., Dear, R.L., 2007. '*Assessing temporary threshold shift in a bottlenose dolphin (Tursiops truncatus) using multiple simultaneous auditory evoked potentials'*. J. Acoust. Soc. Am. 122, 1249-1264.

Fisheries and Oceans Canada (DFO), 2017. '*Action Plan for the Northern and Southern Resident Killer Whale (Orcinus orca) in Canada'.* Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. v + 33 pp.

Fishing Tasmania, 2023a. '*Rock lobster fishery*'. https://fishing.tas.gov.au/commercial-fishing/commercial-fisheries/rock-lobster-fishery

Fishing Tasmania, 2023b. '*Giant crab fishery*'. https://fishing.tas.gov.au/commercial-fishing/commercial-fisheries/giant-crab-fishery

Fishing Tasmania, 2023c. 'Scalefish fishery'. https://fishing.tas.gov.au/commercial-fishing/commercial-fisheries/scalefish-fishery

Fishing Tasmania, 2023d. '*Commercial Dive Fishery*'. https://fishing.tas.gov.au/commercial-fishing/commercial-fisheries/commercial-dive-fishery

Fishing Tasmania, 2023e. '*2023 Scallop Season*'. https://fishing.tas.gov.au/commercial-fishing/commercial-fisheries/scallop-fishery/commercial-scallop-season

Fishwell Consulting Pty Ltd, 2020. '*Multiple – Before After Control Impact analysis of the effect of a 3D marine seismic survey on Danish Seine catch rates, Summary Results: Phase I, II & III'*. FRDC Project 2019-072, 15 October 2020.

Fletcher, L.M., Zaiko, A., Atalah, J., Richter, I., Dufour, C.M., Pochon, X., Wood, S.A., Hokpins, G.A., 2017. '*Bilge Water as a Vector for the Spread of Marine Pests: A Morphological, Metabarcoding and Experimental Assessment'*. Biological Invasions, DOI 10.1007/s10530-017-1489-y.

Ford, J., Gilmour, P., 2013. '*The state of recreational fishing in Victoria: a review of ecological sustainability and management options, a report to the Victorian National Parks Association, Melbourne*'.

Fordyce, R.E., Marx, F.G., 2012. '*The pygmy right whale Caperea marginata: the last of the cetotheres*'. Proceedings of the Royal Society B., 280: 20122645.

Fothergill, D.M., Sims, J.R., Curley, M.D., 2001. '*Recreational scuba divers' aversion to low-frequency underwater sound*'. Undersea & hyperbaric medicine, 28(1), p.9.

Fothergill, D.M., Waltz, M.D., Forsythe, S.E., 2000. '*Diver aversion to low frequency underwater sound phase II: 600 -2500 Hz*'. Undersea and Hyperbaric Medicine 27: 18.

Francis, L., Natanson, L., Campana, S., 2002. '*The biology and ecology of the porbeagle shark, Lamna nasus*'. In: Camhi, M., Pikitch, E., Babcock, E. (Eds), 'Sharks of the open ocean: biology, fisheries and conservation'. Pg 105 – 113. Blackwell Publishing, United Kingdom.

Fraser, K., Hartmann, K., Haddy, J., Krueck, N., 2022. '*Tasmanian scalefish fishery assessment 2020/21*'. https://www.imas.utas.edu.au/__data/assets/pdf_file/0005/1632515/Scalefish-Assessment_2020-21.pdf

Fraser, K., Hartmann, K., Krueck, N., 2021. '*Tasmanian Scalefish Fishery Assessment 2019/20*'. October 2021.

Friesen, M.R., Ross, J.R., Robinson, R., Kozmian-Ledward, L., Gaskin, C.P., 2017. '*Diving and foraging behaviour of petrels and shearwaters*'. Report prepared by Northern New Zealand Seabird Trust for the New Zealand Department of Conservation, Wellington. 28p.

Fuiman, L.A., R.G. Werner. 2002. '*Fishery Science The Unique Contributions of Early Life Stages*'. Chapter 7 (161-182), Chapter 10 (222-241). ISBN-0-632-05661-4. Bodmin, Cornwall.

Fujioka, K., Hobday, A.J., Kawabe, R., Miyashita, K., Itoh, T., Takao, Y., 2010. '*Interannual variation in summer habitat use by juvenile southern bluefin tuna (Thunnus maccoyii) in southern western Australia*'. Fish Oceanography, 19: 183 – 195.

Funk, D., Hannay, D., Ireland, D., Rodrigues, R., Koski, W., (eds.). 2008. '*Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–November 2007: 90-day report*'. LGL Report P969-1. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. 218 pp.

Gaburzi, J.C., McCarthy, M.L., 2018. '*How do they do it? – Understanding the success of marine invasive species*'. YOUMARES 8 – Oceans Across Boundaries: learning from each other. Conference Paper.

Gales, N., Double, M., Robinson, S., Jenner, C., Jenner, M., King, E., Gedamke, J., Childerhouse, S., Paton, D., 2010. '*Satellite tracking of Australian humpback whales (Megaptera novaeangliae) and pygmy blue whales (Balaenoptera musculus brevicauda)*'. Report for the International Whaling Commission 2010. SC/62/SH21.

Gales, N., Double, M.C., Robinson, S., Jenner, C., Jenner, M., King, E., Gedamke, J., Paton, D., Raymond, B., 2009. '*Satellite tracking of southbound East Australian humpback whales (Megaptera novaeangliae): challenging the feast or famine model for migrating whales*'. 2008 meeting of the International Whaling Commission – Scientific Committee, Paper SC/61/SH17, 12 pp.

Garcia-Rojas, M.I., Jenner, K.C.S., Gill, P.C., Jenner, M-N.M., Sutton, A.L., McCauley, R.D., 2018. '*Environmental evidence for a pygmy blue whale aggregation area in the Subtropical Convergence Zone south of Australia*'. Marine Mammal Science, 34(4): 901 – 923.

Gausland, I., 2003. '*Seismic surveys impact on fish and fisheries*'. Report for Norwegian Oil Industry Association, 41p.

Gavrilov, A.N., McCauley, R.D., Salgado-Kent, C., Tripovich, J., Burton, C., 2011. '*Vocal characteristics of pygmy blue whales and their change over time*'. Journal of the Acoustical Society of America, 130(6): 3651 – 3660.

Gavrilov, G.M., Markina, N.P., 1979. '*The feeding ecology of fishes of the genus Seriolella (fam. Nomeidae) on the New Zealand Plateau*'. Journal of Ichthyology, vol. 19(6): 128 – 135.

Geoscience Australia, 2018. '*ProvExplorer – Otway Basin*' http://www.ga.gov.au/provexplorer/provinceDetails.do;jsessionid=1BD8A7AA5A481EFFEF8D85B04AA0EAE3?eno=436513

Gerstein, E.R., 2002. '*Manatees, bioacoustics, and boats*'. American Scientist 90:154–163.

Gibbens, J., Arnould, J.P.Y., 2009. '*Interannual variation in pup production and the timing of breeding in benthic foraging Australian fur seals*'. Marine Mammal Science 25(3): 573-587.

Gill, P., 2015. '*Blue whale study aerial surveys, southern Australia, 2007 – 2012*'. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1281) on 2023-03-29. https://doi.org/10.15468/tar989 accessed via GBIF.org on 2023-03-29.

Gill, P.C. 2001. '*The blue whale feeding area off western Victoria & southeast South Australia*'. Victorian Regional Ripples 8(3).

Gill, P.C., 2002. '*A blue whale (Balaenoptera musculus) feeding ground in a southern Australian coastal upwelling zone*'. Journal of Cetacean Research and Management, 4: 179 – 184

Gill, P.C., 2020. '*Blue Whale Literature Review - Offshore Victoria (Otway basin/Bass Strait)*'. Report to Beach Energy Limited. Blue Whale Study Inc.

Gill, P.C., Kemper, C.M., Talbot, M., Lyons, S.A., 2008. '*Large group of pygmy right whales seen in a shelf upwelling region off Victoria, Australia'*. Marine Mammal Science, 24(4): 962 – 968.

Gill, P.C., Morrice, M.G., Page, B., Pirzl, R., Levings, A.H., Coyne, M., 2011. '*Blue whale habitat selection and within-season distribution in a regional upwelling system off southern Australia'*. Marine Ecology Progress Series 421: 243-263

Gill, P.C., Pirzl, R., Morrice, M.G., Lawton, K., 2015. '*Cetacean diversity of the continental shelf and slope off southern Australia'*. The Journal of Wildlife Management, 79(4): 672 – 681.

Giri, K., Hall, K., 2015. '*South Australian Recreational Fishing Survey 2013/14*'. Fisheries Victoria Internal Report Series No. 62. July 2015. Department of Economic Development, Jobs, Transport & Resources. State Government of Victoria.

Girola, E., Dunlop, R.A., Noad, M.J., 2023. '*Singing humpback whales respond to wind noise, but not to vessel noise'*. Proc. R. Soc. B 290: 20230204. https://doi.org/10.1098/rspb.2023.0204

Gisiner, R., 2017. '*Review notes on Dunlop et al. (2017) "Determining the behavioural dose-response relationship of marine mammals to air gun noise and source proximity*" (Journal of Experimental Biology (2017) 220: 2878-2886. Doi: 10.1242/jeb.160192)'. Dr. Robert Gisiner, IAGC Director, Marine Environment Science/Biology. IAGC NewsBrief: 18 October 2017.

Gjerdrum, C., Ronconi, R.A., Turner, K.L., Hamer, T.E., 2021. '*Bird strandings and bright lights at coastal and offshore industrial sites in Atlantic Canada*'. Avian Conserv. Ecol. 16:22. doi: 10.5751/ace-01860-160122

Goldbogen, J.A., Calambokidis, J., Oleson, E., Potvin, J., Pyenson, N.D., Schorr, G., Shadwick, R.E., 2011. '*Mechanics, hydrodynamics and energetics of blue whale lunge feeding: efficiency dependence on krill density'*. Journal of Experimental Biology, 214: 131 – 146.

Goldsworthy, S.D., Mackay, A.I., Shaughnessym P.D., Bailleul, F., Holman, D., 2015. '*Maintaining the monitoring of pup production at key Australian sea lion colonies in South Australia (2014/15)*'. Final Report to the Australian Marine Mammal Centre. SARDI Publication No. F2010/000665-5. SARDI Research Report Series No. 871.

Goldsworthy, S.D., Page, B., 2009. '*A review of the distribution of seals in South Australia'*. Australian Research and Development Institute, Adelaide, SARDI Publication No. F2009/000368-1, 21p.

Goldsworthy, S.D., Shaughnessy, P.D., Mackay, A.I., Bailleul, F., Holman, D., Lowther, A.D., Page, B., Waples, K., Raudino, H., Bryars, S., Anderson, T., 2021. '*Assessment of the status and trends in abundance of a coastal pinniped, the Australian sea lion Neophoca cinerea'*. Endangered Species Research 44: 421-437.

Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D., Lesage, V., 2016. '*A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy*'. Canadian Journal of Zoology 94: 801–819.

Gomon, M.F., 2008. '*Family Centrolophidae Trevallas, Ruffes'*. In: Gomon M, Bray D and Kuiter R (eds.) (2008). Fishes of Australia's Southern Coast. New Holland Publishers, Sydney, pp. 795 – 800.

Gomon, M.F., Bray, D.J., Kuiter, R., 2008. '*Fishes of Australia's southern coast'*. Reed New Holland, Australia.

Goodall, C., Chapman, C., Neil, D., Tautz, J., Reichert, H., 1990. '*The acoustic response threshold of the Norway lobster, Nephrops norvegicus (l.) in a free sound field*'. pp. 106–113 in Wiese, K., Krenz, W.D., Tautz, J., Reichert, H., and Mulloney, B. (eds.), Frontiers in crustacean neurobiology. Birkhauser, Basel, Switzerland.

Goold, J.C., 1996. '*Acoustic assessment of populations of common dolphins Delphinus delphis in conjunction with seismic surveying'*. J. Mar. Biol. Ass. UK., 76:811-820.

Gordon, J., Gillespie, D., Potter, J., Frantzis, A., Simmonds, M.P., Swift, R., Thompson, D., 2003. '*A Review of the Effects of Seismic Surveys on Marine Mammals*'. Marine Technology Society Journal, 37(4):16-34.

Gordon, J., Moscrop, A., 1996. '*Underwater noise pollution and its significance for whales and dolphins*'. In Simmonds, M.P. and Hutchinson, J.D. (Eds.), The conservation of whales and dolphins. John Wiley and Sons, Ltd.

Gray, H., van Waerebeek, K., 2011. '*Postural instability and akinesia in a panspotted tropical dolphin Stenella attenuata, in proximity to operating airguns of a geophysical seismic vessel*'. Journal for Nature Conservation 19(6): 363 – 367.

Gray, M.D., Rogers, P.H., Popper, A.N., Hawkins, A.D., Fay, R.R., 2016. *'Large tank acoustics: how big is big enough?'.* The Effects of Noise on Aquatic Life II., pages 363-370. Springer + Business Media, New York.

Green, B.S., Gardner, C., 2009. '*Surviving a sea-change: survival of southern rock lobster (Jasus edwardsii) translocated to a site of fast growth*'. ICES Journal of Marine Science 66: 656–664.

Greenberg, M.I., Sexton, K.J., Vearrier, D., 2016. '*Sea-dumped chemical weapons: environmental risk, occupational hazard*'. Clinical Toxicology, 54(2): 79 – 91.

Grøn, O., Boldreel, L.O., Cvikel, D., Kahanov, Y., Galili, E., Hermand, J-P., Nævestad, D., Reitan, M., 2015. '*Detection and mapping of shipwrecks embedded in sea-floor sediments*'. Journal of Archaeological Science: Reports, 4: 242 – 251.

Gunditjmara Aboriginal Cooperative Limited, 2022. '*Our Story*'. https://www.gunditjmara.org.au/about-us

Haddon, M. 2017. '*On the Potential Effects of a Seismic Survey on Commercial Fishery Catch Rates in the Great Australian Bight*'.

Hale, P.T., Barreto, A.S., Ross. G.J.B., 2000. '*Comparative Morphology and Distribution of the aduncus and truncatus forms of Bottlenose Dolphin Tursiops in the Indian and Western Pacific Oceans*'. Aquatic Mammals, 26(2): 101-110.

Halfwerk, W., Holleman, L.J.M., Lessells, C.M., Slabbekoorn, H., 2011. '*Negative impact of traffic noise on avian reproductive success*'. J. Appl. Ecol., 48:210-219.

Hallegraeff, G.M., Jeffrey, S.W., 1993. '*Annually recurrent diatom blooms in spring along the New South Wales coast of Australia*'. Australian Journal of Marine and Freshwater Research, 39: 245 – 288.

Halvorsen, M.B., Zeddies, D.G., Ellison, W.T., Chicoine, D.R., Popper, A.N., 2013. '*Effects of low-frequency naval sonar exposure on three species of fish*'. The Journal of the Acoustical Society of America, 131: 599 – 607.

Hamann, M., Limpus, C., Hughes, G., Mortimer, J., Pilcher, N., 2006. '*Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South East Asia*'. Bangkok: IOSEA Marine Turtle MoU Secretariat.

Hamer, D.J., Ward, T.M., Shaughnessy, P.D., Clark, S.R., 2011. '*Assessing the effectiveness of the Great Australian Bight Marine Park in protecting the endangered Australian sea lion (Neophoca cinerea) from by-catch mortality in shark gill-nets*'. Endangered Species Research 14: 203-216.

Handegard, N., Tronstad, T., Hovem, J., Jech, J., 2013. '*Evaluating the Effect of Seismic Surveys on Fish – The Efficacy of Different Exposure Metrics to Explain Disturbance'.* Canadian Journal of Fisheries and Aquatic Sciences, 70:1271 – 1277.

Hannay, D., Racca, R., 2005. '*Acoustic model validation. Document 0000-S-90-04-T-7006-00-E, Revision 02. Technical report for Sakhalin Energy Investment Company by JASCO Research*'. Available at: www.sakhalinenergy. ru/media/acd4ec1d-483c-470a-b2b7-014ebde76eb3.pdf

Harcourt, R., Davis, L., 1997. '*The use of satellite telemetry to determine fur seal foraging areas*'. In Hindell, M., Kemper, C. (eds), Marine Mammal Research in the Southern Hemisphere, pp 137 – 142.

Harcourt, R.G., Schulman, A.M., Davis, L.S., Trillmich, F., 1995. '*Summer foraging by lactating female New Zealand fur seals (Arctocephalus forsteri) off Otago Peninsula, New Zealand*'. Can. J. Zool., 73: 678 – 690.

Harland, E.J., Jones, S.A., Clarke, T. 2005. '*SEA 6 Technical report: Underwater ambient Noise*'. Produced by QinetiQ as part of the UK Department of Trade and Industry's offshore energy Strategic Environmental Assessment programme. QINETIQ/S&E/MAC/CR050575.

Harrington, J. J., McAllister, J., Semmens, J.M., 2010. *'Assessing the short-term impact of seismic surveys on adult commercial scallops (Pecten fumatus) in Bass Strait'*. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

Harris, P.T., Smith, R., Anderson, O., Coleman, R., Greenslade, D., 2000'. '*GEOMAT Modelling of continental shelf sediment mobility in support of Australia's regional marine planning process*'. AGSO Record, 2000/41, 53 pp.

Harrison, P., Burns, D., Fury, C., Luker, G.O., 2009. '*Conservation and values: global cetacean summary report*'. Department of the Environment, Water, Heritage and the Arts, Canberra.

Hassel, A., Knutsen, T., Dalen, J., Skaar, K., Lokkeborg, S., Misund, O., Ostensen, O., Fonn, M., Haugland, E., 2004. '*Influence of seismic shooting on the lesser sandeel (Ammodytes marinus)*'. ICES Journal of Marine Science, 61:1165-1173.

Hastings, M.C., Popper, A.N., 2005. '*Effects of sound on fish*'. Technical report by Jones & Stokes, California, USA for the California Department of Transportation, California.

Hatch, L., Wahle, C., Gedamke, J., Harrison, J., Laws, B., Moore, S., Stadler, H., Van Parijs, S. 2016. '*Can you hear me here? Managing acoustic habitat in US waters*'. Endangered Species Research. 30, 171–186.

Hawkins, A. D., Pembroke, A., Popper, A., 2015. '*Information gaps in understanding the effects of noise on fishes and invertebrates*'. Reviews in Fish Biology and Fisheries, 25: 39–64.

Hawkins, A.D., Popper, A.N., 2016. '*A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates*'. ICES Journal of Marine Science 74(3): 635-651

Hazel, J., Lawler, I.R., Marsh, H., Robson, S., 2007. '*Vessel speed increases collision risk for the Green turtle Chelonia mydas*'. Endangered Species Research, 3:105-113.

Heap,A.D., 2009. '*Marine sediments (MARS) database*'. Commonwealth of Australia (Geoscience Australia), Creative Commons Attribution 4.0 International Licence. http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_69869.

HELCOM, 2005. '*Press release regarding chemical weapons dumped in the Baltic*'. Helsinki Commission, May 2, www.helcom.fi/press_office/news_helcom/en_GB/ChemicalMunitions1115039886140/

Henry, G.W., Lyle, J.M., 2003. '*That national recreational and indigenous fishing survey*'. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, Project No. 1999/158.

Heyward, A., Colquhoun, J., Cripps, E., McCorry, D., Stowar, M., Radford, B., Miller, K., Miller, I., Bettershill, C., 2018. '*No evidence of damage to the soft tissue or skeletal integrity of mesophotic corals exposed to a 3D marine seismic survey*'. Marine Pollution Bulletin, 129(1): 8 – 13.

Hildebrand, J.A., 2009. '*Anthropogenic and natural sources of ambient noise in the ocean*'. Marine Ecology Progress Series, 395: 5 - 20.

Hobday, A.J., Evans, K., Eveson, J.P., Farley, J.H., Hartog, J.R., Basson, M., Patterson, T.A., 2015. '*Distribution and migration – southern bluefin tuna (Thunnus maccoyii)*'. In, 'Biology and Ecology of Bluefin Tuna.

Hobday, A.J., Kawabe, R., Takao, Y., Miyashita, K., Itoh, T., 2009. '*Correction of an abundance index using acoustic tag data for juvenile southern bluefin tuna in southern Western Australia*'. In, 'Tagging and tracking of marine animals with electronic devices II. Reviews: Methods and technologies in fish biology and fisheries', Nielsen, J., Silbert, J.R., Hobday, A.J., Lutcavage, M.E., Arrizabalaga, H., Fragosa, N. (Eds), pp. 405 – 422, Springer, Netherlands.

Hoenner, X., Whiting, S.D., Enever, G., Lambert, K., Hindell, M.A., McMahon, C.R., 2016. '*Nesting ecology of hawksbill turtles at a rookery of international significance in Australia's Northern Territory*'. Wildlife Research, 43:461-473.

Holt, M.M., Noren, D.P., Veirs, V., Emmons, C.K., Veirs, S., 2008. '*Speaking up: Killer whales (Orcinus orca) increase their call amplitude in response to vessel noise*'. Journal of the Acoustical Society of America, 125(1): EL27 – EL32.

Hook, S., Batley, G., Holloway, M., Irving, P., Ross, A., 2016. '*2016 Oil Spill Monitoring Handbook*'. CSIRO Publishing Melbourne.

Horwood, J., 2009. '*Sei whale Balaenoptera borealis'.* In, W. F. Perrin and B. Würsig and J. G. M. Thewissen (Ed.), Encyclopedia of marine mammals, pp. 1001-1003. Academic Press, United States

Hosack, G.R., Dambacher, J.M., 2012. '*Ecological Indicators for the Exclusive Economic Zone of Australia's South East Marine Region*'. A report prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. CSIRO Wealth from Oceans Flagship, Hobart.

Hoskins, A.J., Dann, P., Ropert-Coudert, Y., Kato, A., Chiaradia, A., Costa, D.P., Arnould, J.P.Y., 2008. '*Foraging behaviour and habitat selection of the little penguin Eudyptula minor during early chick rearing in the Bass Strait, Australia*'. Marine Ecology Progress Series, 366: 293-303.

Houde, E.D., Zastrow, C.E., 1993. '*Ecosystem- and taxon-specific dynamic and energetics properties of larval fish assemblages*'. Bulletin of Marine Science 53(2): 290-335.

Houghton, J., Doyle, T., Wilson, M., Davenport, J., Hays, G., 2006. '*Jellyfish aggregations and leatherback turtle foraging patterns in a temperate coastal environment*'. Ecology, 8:1967-1972.

Hubert, J., Campbell, J.A., Slabbekoorn, H., 2020. '*Effects of seismic airgun playbacks on swimming patterns and behavioural states of Atlantic cod in a net pen*'. Marine Pollution Bulletin, 160, p.111680.

IMOS, 2023. '*IMOS OceanCurrent Surface Currents and Temperature*'. http://oceancurrent.imos.org.au/

Integrated Marine Observing System (IMOS) n.d. Victoria Moorings. Available at: https://imos.org.au/facilities/nationalmooringnetwork/nationalmooringnetwork/victoria-moorings

Integrated Marine Observing System (IMOS), 2014. '*Southern Australian Integrated Marine Observing System (SAIMOS) Node Science and Implementation Plan 2015-25'.*

International Association of Geophysical Contractors (IAGC). 2017. IAGC zooplankton paper talking points. IAGC Position Statement. 28th June 2017.

International Hydrographic Organisation (IHO), 2001. '*Standardization of undersea feature names: guidelines proposal form terminology*'. International Hydrographic Organisation and International Oceanographic Commission, Monaco. 40pp.

International Whaling Commission (IWC), 2001. '*Report of the workshop on the comprehensive assessment of right whales: A worldwide comparison*'. Journal of Cetacean Research and Management. Page(s) 1-60.

International Whaling Commission (IWC), 2010. '*Report of the Southern Right Whale Die-Off*'. Workshop 15–18 March 2010, Centro Nacional Patagónico, Puerto Madryn, Argentina SC/62/Rep1Jackson *et al.*, 2014 – humpback

International Whaling Commission (IWC), 2013. '*Report of the IWC Workshop on the Assessment of Southern Right whales*'. Journal of Cetacean Research and Management. 14(Supp.):439-461.

IOGP, 2017. 'Seismic Surveys & Marine Mammals'. Joint IOGP/IAGC position paper, Report 576, 12p.

IPIECA, 2015. Impacts of oil spills on marine ecology: Good practice guidelines for incident management and emergency response personnel. IPIECA-IOGP Report 525.

IPIECA, 2016: Response strategy development using net environmental benefit analysis (NEBA): Good practice guidelines for incident management and emergency response personnel. IPIECA-IOGP Report 527.

Ireland, D.S., Rodrigues, R., Funk, D., Koski, W., Hannay, D., 2009. '*Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October 2008: 90-Day Report*'. Document Number LGL Report P1049-1. 277 pp.

Irvine, L.M., Palacios, D.M., Lagerquist, B.A., Mate, B.R., 2019. '*Scales of blue and fin whale feeding behaviour off California, USA, with implications for prey patchiness'*. Frontiers in Ecology and Evolution, 7(338). https://doi.org/10.3389/fevo.2019.00338.

Itoh, T., Kemps, H.A., Totterdell, J.A., 2011. '*Diet of young southern bluefin tuna Thunnus maccoyii in the south western coastal waters of Australia in summer'*. Fish. Sci., 77: 337 – 344.

ITOPF, 2011. '*Effects of Oil Pollution on the Marine Environment*'. Technical Information Paper. Technical paper No. 13. The International Tank Owners Pollution Federation Limited.

IWC, 2007. '*Report of the Scientific Committee Annex K*'. Report of the Stranding Working Group on Environmental Concerns. Journal of Cetacean Research and Management Supplement 9: 227-296.

Jackson, J.A., Steel, D.J., Beerli, P., Congdon, B.C., Olavarria, C., Leslie, M.S., Pomilla, C., Rosenbaum, H., Baker, C., 2014. '*Global diversity and oceanic divergence of humpback whales (Megaptera novaeangliae)*'. Proceedings of the Royal Society B, 281: 20133222

Jakupsstovu, S., Olsen, D., Zachariassen, K., 2001. '*Effects of seismic activities on the fisheries at the Faroe Islands'*. Fiskerirannsóknanstovan Report, Tórshavn, Faroe Islands. 92 s.

James, N.P., Bone, Y., 2011. '*Carbonate production and deposition in a warm-temperate macroalgal environment, Investigator Strait, South Australia'*. Sedimentary Geology, 240(1-2), 41–53.

James, N.P., Bone, Y., Von Der Borche, C.C., Gostin, V.A., 1992. '*Modern carbonate and terrigenous clastic sediments on a cool water, high energy, mid-latitude shelf: Lacepede, southern Australia'*. Sedimentology, 39(5), 877–903.

Jenner, K.C.S., Jenner, M-N.M., McCabe, K.A., 2001. '*Geographical and temporal movements of humpback whales in Western Australian waters'*. APPEA Journal, 2001: 741-765.

Jensen, A.S., Silber, G.K., Calambokidis, J., 2004. '*Large Whale Ship Strike Database'*. Washington, DC: US Department of Commerce, National Oceanic and Atmospheric Administration.

Jensen, F.H., Bejder, L., Wahlberg, M., Aguilar Soto, N., Johnson, M., Madsen, P.T., 2009. '*Vessel noise effects on delphinid communication'*. Marine Ecology Progress Series, 395: 161 – 175.

Jensen, F.H., Marrero Perez, J., Johnson, M., Aguilar Soto, N., Nadsen, P.T., 2011. '*Calling under pressure: short-finned pilot whales make social calls during deep foraging dives*'. Proceedings of the Royal Society B, doi:10.1098/rspb.2010.2604.

Jenssen, B.M., 1994. '*Effects of oil pollution, chemically treated oil, and cleaning on the thermal balance of birds*'. Environmental Pollution, 86(2): 207 – 215.

Jochens, A., Biggs, D., Engelhaupt, D., Gordon, J., Jaquet, N., Johnson, M., Leben, R., Mate, B., Miller, P., Ortega-Oritz, J., Thode, A., Tyack, P., Wormuth, J., Wűrsig, B., 2016. '*Sperm whale seismic study in the Gulf of Mexico; summary report, 2002 – 2004'*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2006-034, 352p.

Johnson, C., 2013. '*Modern and historical data identify sperm whale (Physeter microphalus) habitat offshore of south-western Australia'*. Masters Thesis, Murdoch University, Perth, Western Australia.

Johnson, M., Soto, N., Madsen, P., 2009. '*Studying the behaviour and sensory ecology of marine mammals using acoustic recording tags: a review*'. Marine Ecology Progress Series, 395: 55-73.

Jolliffe, C.D., McCauley, R.D., Gavrilov, A.N., Jenner, C., Jenner, M.N., 2021. '*Comparing the acoustic behaviour of the Eastern Indian Ocean Pygmy Blue Whale on two Australian feeding grounds'*. Acoustics Australia, doi: 10.1007/s40857-021-00229-2.

Jones, I.S.F., 1980. '*Tidal and Wind-drive Currents in Bass Strait*'. Aus. J. Mar. Freshwater Res., (31): 109–117.

Jones, I.S.F., Pradman, L., 1983. '*Semidiurnal internal tides in eastern Bass Strait'*. Australian Journal of Marine and Freshwater Research 34: 159–171.

Kaifu, K., Segawa, S., Tsuchiya, K., 2007. '*Behavioral responses to underwater sound in the small benthic octopus Octopus ocellatus*'. The Journal of the Marine Acoustics Society of Japan, 34(4), 266-273.

Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A., Grieve, C., 1993. '*Australian Fisheries Resources'*. Canberra: Department of Primary Industries and the Fisheries Research and Development Corporation, Bureau of Rural Sciences.

Kämpf, J., 2010. '*On preconditioning of coastal upwelling in the eastern Great Australian Bight*'. Journal of Geophysical Research, 115, doi: 10.1029/2010JC006294.

Kämpf, J., Newman, M., Doubell, M., Möller, L., Baring, R., Shute, A., Rodriguez, A.R., 2023. '*A study of the seasonal and interannual variability of phytoplankton and zooplankton assemblages in a significant marine ecosystem'*. Oceanologia. https://doi.org/10.1016/j.oceano.2022.12.003

Kaschner, K., Rius-Barile, J., Kesner-Reyes, K., Garilao, C., Kullander, S.O., Rees, T., Froese, R., 2010. '*Computer Generated Map for Seriolella brama'*. AquaMaps: Predicted range maps for aquatic species. World wide web electronic publication, www.aquamaps.org, Version 08/2010.

Kastelein, R., Helder-Hoek, L., Covi, J., Gransier, R., 2016. '*Pile driving playback sounds and temporary threshold shift in harbour porpoises (Phocoena phocoena): effect of exposure duration*'. Journal of the Acoustical Society of America 139(5): 2842-2851.

Kato, H., 2002. Bryde's Whales *Balaenoptera edeni* and *B. brydei*. **In:** Perrin W.F., B. Wrsig & H.G.M. Thewissen, eds. Encyclopedia of Marine Mammals. Page(s) 171-177. Academic Press.

Kavanagh, A., Nykanen, M., Hunt, W., Richardson, N., Jessopp, M. 2019. '*Seismic surveys reduce cetacean sightings across a large marine ecosystem*'. Scientific Reports 9: 19164.

Kemper, C., 2008. '*Analysis of South Australian Museum's cetacean data: distribution, seasonal trends and circumstances of 'death'*. Report for the Department of the Environment, Water, Heritage and the Arts, Reference No. 2008/05955.

Kemper, C.M., 2002. '*Distribution of the pygmy right whale, Caperea marginata, in the Australasian region*'. Marine Mammal Science 18: 99-111.

Kemper, C.M., 2004. '*Osteological variation and taxonomic affinities of bottlenose dolphins, Tursiops spp., from South Australia*'. Australian Journal of Zoology, 52: 29-48.

Kemper, C.M., Middleton, J.F., van Ruth, P.D., 2013. '*Association between pygmy right whales (Caperea marginata) and areas of high marine productivity off Australia and New Zealand*'. New Zealand Journal of Zoology, 40(2): 102 – 128.

Kent, J., Jenkins, G., Acevedo, S., 2013. '*Temporal and spatial patterns in ichthyoplankton assemblages in bay and open coastal environments*'. Journal of fish biology, 82(2), 408-429.

Ketos Ecology, 2009. '*Turtle Guards: A method to reduce the marine turtle mortality occurring in certain seismic survey equipment*.' Ketos Ecology Report, 14 pp.

Kirillin, G., Grossart, H-P., Tang, K.W., 2012. '*Modelling sinking rate of zooplankton carcasses: Effects of stratification and mixing*'. Limnology and Oceanography 57(3): 881–894.

Kirkwood, R., Pemberton, D., Gales, R., Hoskins, A.J., Mitchell, T., Shaughnessy, P.D., Arnould, J.P.Y., 2010. '*Continued population recovery by Australian fur seals*'. Marine and Freshwater Research 61: 695-701.

Kirkwood, R., Warneke, R.M., Arnould, J.P.Y., 2009. '*Recolonization of Bass Strait, Australia, by the New Zealand fur seal, Arctocephalus forsteri.*' Marine Mammal Science 25(2): 441-449.

Klimley, A.P., Myrberg, J.A.A., 1979. '*Acoustic stimuli underlying withdrawal from a sound source by adult lemon sharks, Negaprion brevirostris (Poey)*'. Bulletin of Marine Science, 29:447–458.

Knuckey, I.A., Sivakumaran, K.P., 2001. '*Reproductive characteristics and per-recruit analyses of blue warehou (Seriolella brama): implications for the South east Fishery of Australia*'. Marine and Freshwater Research, vol. 52: 575 – 587

Koboević, Ž, Mišković, D., Hrošik, R.C., Koboević, N., 2022. '*Analysis of Sea Pollution by Sewage from Vessels*'. Sustainability 2022, 14, 263. https://doi.org/10.3390/su14010263

Kordjazi, Z., Frusher, S., Buxton, C. D., Gardner, C., 2015. '*Estimating survival of rock lobsters from long-term tagging programmes: how survey number and interval influence estimates*'. ICES Journal of Marine Science 72: 244–251.

Koschinski, S., Kock, K.H., 2009. '*Underwater unexploded ordnance—methods for a cetacean-friendly removal of explosives as alternatives to blasting*'. Reports Int. Whal. Comm. SC/61, 1–13.

Koslow, J.A., Bulman, C.A., Lyle, J.M., Haskard, K.A., 1995. '*Biomass Assessment of a Deep-water Fish, the Orange Roughy (Hoplostethus atlanticus), based on an Egg Survey*'. Marine Freshwater Research, 46: 819-830.

Kostyuchenko, L., 1973. '*Effects of elastic waves generated in marine seismic prospecting on fish eggs in the Black Sea*'. Hydrobiological Journal 9: 45–48.

Krueck, N., Hill, N., Hartmann, K., Fraser, K., 2021. '*Tasmanian octopus fishery assessment 2019/20*'. https://www.imas.utas.edu.au/__data/assets/pdf_file/0009/1439595/Octopus-Assessment-2019-20.pdf

La Bella, G., Cannata, S., Froglia, C., Modica, A., Ratti, S., Rivas, G., 1996. '*First assessment of effects of air-gun seismic shooting on marine resources in the central Adriatic Sea*'. In SPE Health, Safety and Environment in Oil and Gas Exploration and Production Conference. Society of Petroleum Engineers.

Lacroix, D.L., Lanctot, R.B., Reed, J.A., McDonald, T.L., 2003. '*Effect of underwater seismic surveys on molting male long-tailed ducks in the Beaufort Sea, Alaska*'. Can. J. Zool., 81:1862-1875.

Ladich F., Collin S.P., Moller P., Kapoor B.G., 2006. '*Fish Communication*'. Enfield (CT): Science Publisher.

Ladich, F., 2000. '*Acoustic communication and the evolution of hearing in fishes*'. Philosophical Transactions of the Royal Society of London B 355(1401): 1285-1288.

Ladich, F., Fay, R.R., 2013. '*Auditory evoked potential audiometry in fish*'. Reviews in Fish Biology and Fisheries, 23: 317 – 364.

Lagardère, J.P., 1982. '*Effects of noise on growth and reproduction of Crangon crangon in rearing tanks*'. Marine Biology, 71, pp.177-185.

Laist, D.W., 1987. '*Overview of the biological effects of lost and discarded plastic debris in the marine environment*'. Marine Pollution Bulletin 18(6): 319 – 326.NERA, 2018. 'Consequence Analysis of an Accidental Release of Diesel'. Environment Plan Reference Case.

Lalas, C., McConnell, H., 2016. '*Effects of seismic surveys on New Zealand fur seals during daylight hours: do fur seals respond to obstacles rather than airgun noise?*' Marine Mammal Science, 32(2): 643 – 663.

Lang, T., Fricke, N., Broeg, K., Baude, R., Brenner, M., Lehtonen, K., Turka, R., Barsiene, J., 2014. '*Health status of cod (Gadus morhua) at dumpsites for chemical warfare agents in the Baltic Sea*'. Conference paper for SETAC 24th Annual Meeting, Basel, Switzerland.

Larcombe, J., Brooks, K., Charalambou, C., Fenton, M., Fisher, M., 2002. '*Marine Matters - Atlas of marine activities and coastal communities in Australia's South East Region'.* Bureau of Rural Sciences, Canberra.

Last, P.R., Gledhill, D.C., 2009. '*A revision of the Australian handfishes (Lophiiformes: Brachionichthyidae), with descriptions of three new genera and nine new species*'. Zootaxa, 2252: 1 – 77.

Last, P.R., Stevens, J.D., 2009. '*Sharks and Rays of Australia (Second Edition)*'. Collingwood, Victoria: CSIRO Publishing.

Law, R.J., Hellou, J., 1999. '*Contamination of fish and shellfish following oil spill incidents*'. Environmental Geosciences, 6(2): 90-98.

Le Corre, M., Ollivier, A., Ribes, S., Jouventin, P., 2002. '*Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean)*'. Biol. Conserv. 105, 93–102. doi: 10.1016/S0006-3207(01)00207-5.

Lee, R.F., Page, D.S., 1997. '*Petroleum hydrocarbons and their effects in subtidal regions after major oil spills*'. Marine Pollution Bulletin, 34(11): 928 – 940.

Lefèvre, C.D., Bellwood, D.R., 2015. '*Disturbance and recolonisation by small reef fishes: the role of local movement versus recruitment*'. Marine Ecology Progress Series 537: 205-215

Lemos, L., Haxel, J., Olsen, A., Burnett, J., Smith, A., Chandler, T., Nieukirk, S., Larson, S., Hunt, K., Torres, L., 2022, '*Effects of vessel traffic and ocean noise on gray whale stress hormones*'. Scientific Reports 12: 18580.

Lenhardt, M.L., 1994. '*Seismic and very low frequency sound induced behaviors in captive loggerhead marine turtles (Caretta caretta)*'. In Proceedings of the fourteenth annual symposium on sea turtle biology and conservation' (KA Bjorndal, AB Bolten, DA Johnson & PJ Eliazar, eds.) NOAA Technical Memorandum, NMFSSEFC-351, National Technical Information Service, Springfield, Virginia (pp. 238-241).

Lenhardt, M.L., Klinger, R.C., Musick, J.A., 1985. '*Marine turtle middle-ear anatomy*'. Journal of Auditory Research, 25: 66–72.

Leonard, M.L., Horn, A.G., 2012. '*Ambient noise increases missed detections in nestling birds*'. Biol. Lett., 8:530-532.

Lerodiaconou, D., Young, M., O'Brien, S., 2020. '*Hydrographic Survey of Apollo Marine Park*'. Final report to Parks Australia, Warrnambool, May. CC BY 4.0 C

Lesage, V., Barrette, C., Kingsley, M.C.S., Sjare, B., 1999. *'The effect of vessel noise on the vocal behaviour of belugas in the St. Lawrence River Estuary, Canada'*. Marine Mammal Science, 15(1): 65 – 84.

Lesser, J.H.R., 1978. '*Phyllosoma larvae of Jasus edwardsii (Hutton)(Crustacea: Decapoda: Palinuridae) and their distribution off the east coast of the North Island, New Zealand*'. New Zealand journal of marine and freshwater research, 12(4), pp.357-370.

Liberman, M.C., 2015. '*Noise-induced hearing loss: permanent vs. temporary threshold shifts and the effects of hair-cell versus neuronal degeneration*'. pp. 1-7 in Popper, A.N. and Hawkins, A.D. (eds.) The effects of noise on aquatic life II. Springer, New York, USA.

Limpus, C., 2006. '*Status of leatherback turtles in Australi*a'. IOSEA Marine Turtle MoU 2006.

Limpus, C.J., 1995. '*A study of the loggerhead turtle, Caretta caretta, in eastern Australia*'. PhD thesis, Brisbane, Department of Zoology, University of Queensland.

Limpus, C.J., 2002. '*Western Australian Marine Turtle Review*'. Queensland Environmental Protection Agency: Brisbane.

Limpus, C.J., 2007. '*A biological review of Australian marine turtle species. 5. Flatback turtle, Natator depressus (Garman)*'. Queensland Environmental Protection Agency.

Limpus, C.J., 2008. '*A biological review review of Australian marine turles 1. Loggerhead turtle Caretta caretta (Linneaus)*'. Available from http://www.epa.qld.gov.au/publications/p02785aa.pdf/A_Biological_Review_Of_Australian_Marine_Turtles_1_Loggerhead_Turtle_emCaretta_Caretta/em_Linnaeus.pdf.

Limpus, C.J., 2009. '*A biological review of Australian marine turtles*'. The State of Queensland. Environmental Protection Agency, 2009.

Limpus, C.J., MacLachlin, N.C., Miller, J.D., 1984. '*Further observations on breeding of Dermochelys coriacea in Australia*'. Australian Wildlife Research, 11:567-571.

Ling, J.K., 1991. '*Recent sightings of killer whales, Orcinus orca (Cetacea: Delphinidae), in South Australia*'. Transactions of the Royal Society of South Australia, 226: 95 – 98.

Linnane, A., McGarvey, R., Feenstra, J., Hawthorne, P., 2018. '*Southern Zone rock lobster (Jasus edwardsii) fishery stock assessment 2016/17*'. SARDI Publication No F2007/000276-12, 90p.

Linnane, A., McGarvey, R., Feenstra, J., Hawthorne, P., 2022. '*Southern Zone Rock Lobster (Jasus edwardsii) Fishery Stock Assessment 2020/21*'. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000276-16. SARDI Research Report Series No. 1141. 67p.

Littnan, C.L., Arnould, J.P.Y., 2002. '*At-sea movements of female Australian fur seals, Arctocephalus pusillus doriferus*'. Australian Mammalogy. 24:65-72.

Loehr, L.C., Beegle-Krause, C-J., George, K., McGee, C.D., Mearns, A.J., Atkinson, M.J., 2006. '*The significance of dilution in evaluating possible impacts of wastewater discharges from large cruise ships*'. Marien Pollution Bulletin, 52(6), 681 – 688.

Løkkeborg, S., Ona, E., Vold, A., Salthaug, A., 2012. '*Sounds from seismic airguns: gear- and species-specific effects on catch rates and fish distribution*'. Can. J. Fish. Aquat. Sci., 69(8): 1278–1291. doi:10.1139/f2012-059.

Lombarte, A., Popper, A.N., 1994. '*Quantitative analyses of postembryonic hair cell addition in the otolithic endorgans of the inner ear of the European hake, Merluccius merluccius (Gadiformes, Teleostei*).' J. Comp. Neurol. 345, 419–428.

Lowry, H., Lill, A., Wong, B.B., 2012. '*How noisy does a noisy miner have to be? Amplitude adjustments of alarm calls in an avian urban 'adapter'*'. PLoS One, 7: e29960.

Luczkovich, J.J., Daniel, H.J., Hutchinson, M., Jenkins, T., Johnson, S.E., Pullinger, R.C., Sprague, M.W., 2000. '*Sounds Of Sex And Death In The Sea: Bottlenose Dolphin Whistles Suppress Mating Choruses Of Silver Perch*'. Bioacoustics, 10:323-334.

Lugli, M., Yan, H.Y., Fine, M.L., 2003. '*Acoustic Communication In Two Freshwater Gobies: The Relationship Between Ambient Noise, Hearing Thresholds And Sound Spectrum*'. J. Comp. Phys. A., 189:309-320.

Lutz, P.L., Musick, J.A., 1996. '*The Biology of Sea Turtles*'. United States of America: CRC Press.

Lyle, J.M., Tracey, S.R., Stark, K.E., Wotherspoon, S., 2009. '*2007-08 survey of recreational fishing in Tasmania*'. Tasmanian Aquaculture and Fisheries Institute Report, 97p

MacGillivray, A., Z. Li., 2018. *Vessel Noise Measurements from the ECHO Slowdown Trial*: Final Report. Document 01518, Version 3.0. Technical Report by JASCO Applied Sciences for Vancouver Fraser Port Authority ECHO Program. ECHO Haro Strait slowdown trial summary by portvancouver - Flipsnack

MacGillivray, A.O., 2018. '*An airgun array source model accounting for high-frequency sound emissions during firing—Solutions to the IAMW source test cases*'. IEEE Journal of Oceanic Engineering, 44(3), pp.582-588.

Machernis, A.F., Powell, J.R., Engleby, L., Spradlin, T.R. 2018. '*An updated literature review examining the impacts of tourism on marine mammals over the last fifteen years (2000-2015) to inform research and management programs*'. U.S. Dept. of Commerce 66:7. DOI: https://doi.org/10.7289/V5/TM-NMFS-SER-7.

Mackay, A.I., Bailleul, F., Carroll, E.L., Andrews-Goff, V., Baker, C.S., Bannister, J., Boren, L., Carlyon, K., Donnelly, D.M., *et al.,* 2020. '*Satellite derived offshore migratory movements of southern right whales (Eubalaena australis) from Australian and New Zealand wintering grounds*'. PLoS ONE, 15(5): e0231577.

Mackay, A.I., Bailleul, F., Childerhouse, S., Donnelly, D., Harcourt, R., Parra, G.J., Goldsworthy, S.D., 2015. '*Offshore migratory movements of southern right whales: informing critical conservation and management needs*'. SARDI Research Report Series No. 859. SARDI Publication NO. F2015/000526-1.

Madsen, P.T., Møhl, B., Nielsen, B.K., Wahlberg, M., 2002. '*Male sperm whale behaviour during exposures to distant seismic survey pulses*'. Aquatic Mammals, 28(3): 231 – 240.

Madsen, P.T., Wahlberg, M., Mohl, B., 2002. '*Male sperm whale (Physeter macrocephalus) acoustics in a high-latitude habitat: implications for echolocation and communication*'. Behav. Ecol. Sociobiol., 53: 31 – 41.

Malme, C.I., Wursig, B., Bird, J.E., Tyack, P., 1988. '*Observations of feeding gray whale responses to controlled industrial noise exposure*'. In Sackinger, W.M., Jeffroes. M.O. (Eds), 'Port and ocean engineering under arctic conditions – symposium on noise and marine mammals'.

Mann, D., Hill-Cook, M., Manire, C., Greenhow, D., Montie, E., et al. 2010. '*Hearing Loss in Stranded Odontocete Dolphins and Whales*'. PLoS ONE 5(11): e13824. doi:10.1371/journal.pone.0013824.

Marine and Safety Tasmania (MAST), 2021. '*Annual Report 2020 – 21.*'. https://mast.tas.gov.au/wp-content/uploads/2021/10/Annual-Report-2020-2021.pdf

Marine Pest Sectoral Committee, 2018. '*National Biofouling Management Guidance for the Petroleum Production and Exploration Industry*'. Department of Agriculture and Water Resources, Canberra, December. CC BY 4.0. Document modified in 2018 to meet accessibility requirements.

Marshall, A., Bennett, M.B., Kodja, G., Hinojosa-Alvarez, S., Galvan-Magana, F., Harding, M., Stevens, G., Kashiwagi, T., 2018a. '*Mobula birostris (amended version of 2011 assessment). The IUCN Red List of Threatened Species 2018*':

Marshall, A., Kashiwagi, T., Bennett, M.B., Deakos, M., Stevens, G., McGregor, F., Clark, T., Ishihara, H., Sato, K., 2018b. '*Mobula alfredi (amended version of 2011 assessment). The IUCN Red List of Threatened Species 2018*': e.T195459A126665723.

Martin, B., K. Broker, M.-N.R. Matthews, J. MacDonnell, L. Bailey. 2015. '*Comparison of measured and modeled air-gun array sound levels in Baffin Bay, West Greenland*'. OceanNoise 2015, 11-15 May, Barcelona, Spain.

Martin, B., McDonnell, J., broker, K., 2017a. '*Cumulative sound exposure levels—Insights from seismic survey measurements*'. The Journal of the Acoustical Society of America, 141(5), pp.3603-3603.

Martin, M.J., Halliday, W.D., Citta, J.J., Quakenbush, L., Harwood, L., Lea, E.V., Dawson, J., Nicoll, A., Insley, S.J., 2023. '*Exposure and behavioural responses of tagged bowhead whales (*Balaena mysticetus*) to vessels in the Pacific Arctic*'. Arctic Science 00: 1–16 (2023): dx.doi.org/10.1139/AS-2022-0052

Martin, M.J., Halliday, W.D., Storrie, L., Citta, J., Dawson, J., Hussey, N.E., 2022. '*Exposure and behavioral responses of tagged beluga whales (Delphinapterus leucas) to ships in the Pacific Arctic*'. Marine Mammal Science, 1–35. doi:10.1111/mms.12978.

Martin, S.B., Matthews, M.N.R., MacDonnell, J.T., Bröker, K., 2017b. '*Characteristics of seismic survey pulses and the ambient soundscape in Baffin Bay and Melville Bay, West Greenland*'. The Journal of the Acoustical Society of America, 142(6), pp.3331-3346.

Mate, B.R., Stafford, K.M., Ljungblad, D.K., 1994. '*A change in sperm whale (Physeter macrocephalus) distribution correlated to seismic surveys in the Gulf of Mexico*'. Conference paper in The Journal of the Acoustical Society of America, 96(5): 3268 – 3269.

Matishov, G.G., 1992. '*The reaction of bottom-fish larvae to airgun pulses in the context of the vulnerable Barent Sea ecosystem*'. Fisheries and Offshore Petroleum Exploitation, 2nd International Conference, 6-8 April, 1992, Bergen, Norway.

Matthews, M.R., MacGillivray, A.O., 2013. '*Comparing modelled and measured sound levels from a seismic survey in the Canadian Beaufort Sea.*' Proceedings of meetings on acoustics Acoustical Society of America 19(1).

May, A., Mackenzie, E., N. Davis, N., Thatcher, N., 2022. '*South-East Commonwealth Marine Reserves Network Management Plan Evaluation*'. Final Report, report to the Director of National Parks (Australian Government Department of Agriculture, Water and the Environment), Sustineo Pty Ltd.

Mayfield, S., Miller, K.J., Mundy C.N., 2014. '*Towards understanding Greenlip abalone population structure*'. Final report for the Fisheries Research and Development Corporation. Prepared by the South Australian research and Development Institute (Aquatic Sciences), Adelaide. FRDC Project N. 201012. 31pp.

McCauley, R., Fewtrell, J., Duncan, A., Jenner, C., Jenner, M.N., Penrose, J., Prince, R., Adhitya, A., Murdoch, J., McKabe, K., 2003. '*Marine seismic surveys: analysis and propagation of air-gun signals; and effects of exposure on humpback whales, sea turtles, fishes and squid*'. In Australian Petroleum Production and Exploration Association (APPEA) (pp. 364-521). Australian Petroleum Production and Exploration Association.

McCauley, R., Fewtrell, J., Popper, A., 2003a. '*High intensity anthropogenic sound damages fish ears*'. Journal of the acoustical society of America, 113:1-5.

McCauley, R.D. 1994. 'Seismic surveys'. pp. 19–122 in Swan, J. M., Neff, J. M. and Young, P. C. (eds.), Environmental implications of offshore oil and gas development in australia— the findings of an independent scientific review. Australian Petroleum Exploration Association, Sydney, NSW.

McCauley, R.D., 2011. '*Woodside Kimberley Sea Noise Logger Program, September 2006 to June 2010: Whales, Fish and Man-Made Noise*'. Centre for Marine Science and Technology, Curtin University CMST Report No. R2010-50_3.

McCauley, R.D., Cato, D.H., 2000. '*Patterns of fish calling in a nearshore environment in the Great Barrier Reef*'. Philosophical Transactions of the Royal Society of London B355(1401): 1289-1293.

McCauley, R.D., Day, R.D., Swadling, K.M., Fitzgibbon, Q.P., Watson, R.A., Semmens, J.M., 2017. '*Widely used marine seismic survey air gun operations negatively impact zooplankton*'. Nature Ecology & Evolution 1, Article 0195.

McCauley, R.D., Fewtrell, J., Duncan, A., Jenner, C., Jenner, M., Penrose, J. D, Prince, R., Adhitya, A., Murdoch, J., McCabe, K., 2003b. '*Marine Seismic Surveys: Analysis and Propagation of Air-gun Signals in Environmental implications of offshore oil and gas development in Australia: further research*'. APPEA Ltd.

McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., McCabe, K., 2000a. '*Marine Seismic Surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid*'. Prepared for Australian Petroleum Production Exploration Association, Project CMST 163, Report R99-15.

McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., McCabe, K., 2000. '*Marine Seismic Surveys – A Study of Environmental Implications*'. APPEA Journal. 40.

McCauley, R.D., Garvilov, A.N., Jolliffe, C.D., Ward, R., Gill, P.C., 2018. '*Pygmy blue and Antarctic blue whale presence, distribution and population parameters in southern Australia based on passive acoustics*'. Deep Sea Research Part II: Topical Studies in Oceanography, 157- 158; 154 – 168.

McCauley, R.D., Jenner, M.-N., Jenner, C., McCabe, K.A., Murdoch, J., 1998. '*The response of humpback whales (Megaptera novaeangliae) to offshore seismic survey noise: Preliminary results of observations about a working seismic vessel and experimental exposures*'. The APPEA Journal 38:692-707.

McCauley, R.D., Salgado Kent, C., 2007. '*Observations, catch and ear pathology of caged fish exposed to seismic survey passes*'. CMST Report R2007-19. Prepared for Santos Ltd., Perth, Western Australia by Centre of Marine Science and Technology, Perth.

McCrea-Strub, A., Kleisner, K., Sumaila, U.R., Swartz, W., Watson, R., Zeller, D., Pauly, D., 2011. '*Potential impact of the Deepwater Horizon oil spill on commercial fisheries in the Gulf of Mexico*'. Fisheries, 36(7):332-336.

McCutcheon, C., Dann, P., Salton, M., Renwick, L., Hoskins, A.J., Gormley, A.M., Arnould, J.P.Y., 2011. '*The foraging range of Little Penguins (Eudyptula minor) during winter*'. Emu, vol. 111, no. 4, pp. 321 – 329.

McDonald, M.A., Calambokidis, J., Teranishi, A.M., Hildebrand, J.A., 2001. '*The acoustic calls of blue whales off California with gender data*'. J. Acoust. Soc. Am., 109(4): 1728 – 1735.

McDonald, M.A., Hildebrand, J.A., Webb, S.C., 1995. '*Blue and fin whales observed on a seafloor array in the Northeast Pacific*'. Journal of the Acoustical Society of America, 98(2): 712 – 721.

McDonald, M.A., Hildebrand, J.A., Wiggins, S.M., Thiele, D., Glasgow, D., Moore, S.E., 2005. '*Sei whale sounds recorded in the Antarctic*'. Journal of the Acoustical Society of America, 118(6).

McKenna, M.F., Ross, D., Wiggins, S.M., Hildebrand, A.J., 2012. '*Underwater radiated noise from modern commercial ships*'. Journal of the Acoustical Society of America 131(1): 92-103.

McNeil, M., 2015. '*Green sea turtle found at Yambuk has died*'. The Standard. Available from: https://www.standard.net.au/story/3268624/northern-australian-turtle-find-at-yambuk-dies/.

McPherson, C., MacGillivray, A.O., Hagar, E., 2018. '*Validation of airgun array modelled source signatures*'. The Journal of the Acoustical Society of America, 144(3), pp.1846-1846.

McQueen, K., Meager, J.J., Nyqvist, D., Skjæraasen, J.E., Olsen, E.M., Karlsen, Ø., Kvadsheim, P.H., Handegard, N.O., Forland, T.N., Doksæter Sivle, L., 2022. '*Spawning Atlantic cod (Gadus morhuna L.) exposed to noise from seismic airguns do not abandon their spawning site*'. ICES Journal of Marine Science, 79: 2697 – 2708.

Medvedeva, N., Polyak, Y., Kankaanpää, H., Zaytseva, 2009. '*Microbial responses to mustard gas dumping in the Baltic Sea*'. Marine Environmental Research, doi: 10.1016/j.marenvres.2009.04.007.

Meekan, M.G., Speed, C.W., McCauley, R.D., Fisher, R., Birt, M.J., Currey-Randall, L.M., Semmens, J.M., Newman, S.J., Cure, K., Stowar, M., Vaughan, B., Parsons, M.J.G., 2021. '*A large-scale experiment finds no evidence that a seismic survey impacts a demersal fish fauna*'. Proceedings of the National Academy of Sciences of the United States of America (PNAS), July 27, 2021 118 (30) e2100869118; https://doi.org/10.1073/pnas.2100869118.

Middleton, J.E., Bye, J.A.T., 2007. '*A review of the shelf-slope circulation along Australia's southern shelves: Cape Leeuwin to Portland*'. Progress in Oceanography, 75: 1 – 41

Middleton, J.F., Cirano, M., 2002. '*A northern boundary current along Australia's southern shelves: the Flinders Current*'. Journal of Geophysical Research, 107(C9), doi: 10.1029/2000JC000701.

Middleton, J.F., Platov, G., 2003. '*The mean summertime circulation along Australia's southern shelves: a numerical study*'. Journal of Physical Oceanography, 33: 2270 – 2287.

Mikhalev, Y., 2000. '*Whales of the Southern Hemisphere. Biology, whaling, perspective of population recovery*'.

Mikkelsen, L., Hermannsen, L., Beedholm, L., Madsen, P.T., Tougaard, J., 2017. '*Simulated seal scarer sounds scare porpoises but not seals: species-specific responses to 12 kHz deterrence sounds*'. Royal Society Open Science, 4(7).

Miles, N.G., Walsh, C.T., Butler, G., Ueda, H., West, R.J., 2013. '*Australian diadromous fishes: challenges and solutions for understanding migrations in the 21st century*'. Marine and Freshwater Research, 65:12-24.

Miles, W., Money, S., Luxmoore, R., Furness, R.W., 2010. '*Effects of artificial lights and moonlight on petrels at St Kilda*'. Bird Study 57, 244–251. doi: 10. 1080/00063651003605064.

Miller, B.S., Collins, K., Barlow, J., Calderan, S., Leaper, R., McDonald, M., Ensor, P., Olson, P., Olavarria, C., Double, M.C., 2014. '*Blue whale songs recorded around South Island, New Zealand 1964-2013*'. Journal of the Acoustical Society of America, 135: 1616-1623.

Miller, B.S., Kelly, N., Double, M.C., Childerhouse, S.J., Laverick, S., Gales, N., 2012. '*Cruise report on SORP 2012 blue whale voyages: development of acoustic methods*'. Paper SC/64/SH11 presented to the IWC Scientific Committee

Miller, C.A., Best, P.B., Perryman, W.L., Baumgartner, M.F., Moore, M.J., 2012. '*Body shape changes associated with reproductive status, nutritive condition and growth in right whales Eubalaena glacialis and* E. australis'. Marine Ecology Progress Series, 4559: 135 – 156.

Miller, I., Cripps, E., 2013. *'Three dimensional marine seismic survey has no measurable effect on species richness or abundance of a coral reef associated fish community'.* Marine Pollution Bulletin, 77:63-70.

Miller, K.J., Maynard, B.T., Mundy, C.N., 2008. '*Genetic diversity and gene flow in collapsed and healthy abalone fisheries*'. Molecular Ecology, 200–211.

Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., tyack, P.L., 2009. '*Using at-sea experiments to study the effects of airguns on the foraging behaviour of sperm whales in the Gulf of Mexico*'. Deep Sea Research Part I: Oceanographic Research Papers, 56(7): 1168 – 1181.

Minchin, D., 2002. '*The potential for ranching the scallop, Pecten maximus-past, present and future: problems and opportunities*'. ICES Marine Science Symposia (1991–2003).

Miyashita, T., Kato, H., Kasuya, T., 1995. '*Worldwide map of cetacean distribution based on Japanese sighting dat*a'. Volume 1. National Research Institute of Far Seas Fisheries, Shizuoka, Japan. 140p.

Mizroch, S.A., Rice, D.W., Breiwick, J.M., 1984. '*The Sei whale Balaenoptera borealis*'. Marine Fisheries Review, 46(4): 25 – 29.

Moein, S.E., Musick, J.A., Keinath, J.A., Barnard, D.E., Lenhardt, M., George, R., 1994. '*Evaluation of seismic sources for repelling sea turtles from hopper dredges*'. Report from Virginia Institute of Marine Science, Gloucester Point, VA, for U.S. Army Corps of Engineers, Vicksburg, MS.

Møhl, B., Wahlberg, M., Madsen, P.T., Heerfordt, A., Lund, A., 2003. '*The monopulsed nature of sperm whale clicks*'. Journal of the Acoustical Society of America, 114(2): 1143 – 1154.

Möller, L.M., Allen, S.J., Harcourt, R.G., 2002. '*Group characteristics, site fidelity and seasonal abundance of bottlenose dolphins Tursiops aduncus in Jervis Bay and Port Stephens, south-eastern Australia*'. Australian Mammalogy, 24: 11 – 21.

Möller, L.M., Attard, C.R.M., Bilgman,, K., Andrews-Goff, V., Jonsen, I., Paton, D., Double, M.C., 2020. '*Movements and behaviour of blue whales satellite tagged in an Australian upwelling system*'. Scientific Reports, 10:21165.

Mollet, H.F., Cailliet, G.M., 1996. '*Using Allometry to Predict Body Mass from Linear Measurements of the White Shark*'. In: Klimley, A.P & D.G Aimley, eds. Great White Sharks The Biology of Carcharodon carcharias. Page(s) 81-89. United States of America: Academic Press.

Mooney, T.A., Hanlon, R.T., Christensen-Dalsgaard, J., Madsen, P.T., Ketten, D.R., Nachtigall, P.E., 2010. '*Sound detection by the longfin squid (Loligo pealeii) studied with auditory evoked potentials: sensitivity to low-frequency particle motion and not pressure*'. Journal of Experimental Biology, 213(21), pp.3748-3759.

Moors-Murphy, H.B., 2014. '*Submarine canyons as important habitat for cetaceans, with special reference to the Gully: a review*'. Deep Sea Research Part II: Topical Studies in Oceanography, 104, pp.6-19.

Morgan, L.E., Shepherd, S.A., 2006. '*Population and spatial structure of two common temperate reef herbivores: abalone and sea urchins*'. In: J.P. Kritzer & P.F. Sale (Eds) Marine Metapopulations. Academic Press: San Diego. pp. 205–234.

Morrice, M.G., Gill, P.C., Hughes, J., Levings, A.H., 2004. '*Summary of aerial surveys for the Santos Ltd EPP32 seismic survey, 2–13 December 2003*'. Report WEG-SO 02/2004 to Santos Ltd. Whale Ecology Group, Deakin University, Warrnambool.

Morris, C.J., Cote, D., Martin, B., Kehler, D., 2018. '*Effects of 2D seismic on the snow crab fishery*'. Fisheries Research 197: 67-77.

Morris, C.J., Cote, D., Martin, S.B., Mullowney, D., 2020. '*Effects of 3D seismic surveying on snow crab fishery*'. Fisheries Research, 232: 105719.

Moulton, V.D., Miller, G.W., 2005. '*Marine mammal monitoring of a seismic survey on the Scotian Slope, 2003*'. Pages 29 – 40, in Lee, K., Bain, H., Hurley, G.V. (Eds), 2005. Acoustic monitoring and marine mammal surveys in The Gully and Outer Scotian Shelf before and during active seismic programs. Environmental Studies Research Funds Report No. 151, 154pp.

Mundy, C., McAllister, J., 2022. '*Tasmanian abalone fishery assessment 2021*'. https://www.imas.utas.edu.au/__data/assets/pdf_file/0004/1589017/Abalone-Fishery-Assessment-2021.pdf

Munro, N.B., Talmage, S.S., Griffin, G.D., Waters, L.C., Watson, A.P., King, J.F., Hauschild, V., 1999. '*The sources, fate, and toxicity of chemical warfare agent degradation products*'. Environmental Health Perspectives, 107(12): 933 – 974.

Murray, S.O., Mercade, E., Roitblat, H.L., 1998. '*Characterizing the graded structure of false killer whale (Pseudorca crassidens) vocalizations*'. Journal of the Acoustical Society of America, 104(3): 1679 – 1688.

Murray-Wallace, C.V., Woodroffe, C.D., 2014. '*Quaternary sea-level changes: a global perspective*'. Cambridge University Press, Cambridge 484pp

Myrberg Jr, A.A., 2001. '*The acoustical biology of elasmobranchs*'. Environmental Biology of Fishes, 60:31-45.

Nabi, M.N., Brown, R.J., Ristovski, Z., Hustad, J.E., 2012. '*A comparative study of the number and mass of fine particles emitted with diesel fuel and marine gas oil (MGO)*'. Atmospheric Environment. Vol. 57, p. 22-28. September 2012.

Nachtigall, P.E., Supin, A.Y., Pawloski, J., Au, W.W.L., 2004. '*Temporary threshold shift after noise exposure in the bottlenose dolphin (Tursiops truncatus) measured using evoked auditory potentials*'. Mar. Mamm. Sci. 20, 673-687.

National Energy Resources Australia (NERA), 2018b. '*Environment Plan Reference Case. Planned discharges of sewage, putrescible waste and grey water*'. https://www.nera.org.au/Attachment?Action=Download&Attachment_id=231

National Energy Resources Australia (NERA), 2018a. '*Environment Plan Reference Case: Consequence analysis of an accidental release of diesel*'. https://referencecases.nera.org.au/Attachment?Action=Download&Attachment_id=227

National Oceans Office, 2002. '*Sea Country: An Indigenous Perspective – The South-east Regional Marine Plan Assessment Reports*'. National Oceans Office, Hobart.

National Science Foundation, 2011. '*Final programmatic environmental impact statement/overseas environmental impact statement for Marine Seismic Research*'. Funded by the National Science Foundation or conducted by the US Geological Survey. Available online from: nsf-usgs-final-eis-oeis_3june2011.pdf

Nedwell, J.R., Edwards, B., Turnpenny, A.W.H., Gordon, J., 2004. '*Fish and marine mammal audiograms: A summary of available information*'. Subacoustech Report ref: 534R0214.

Nelms, S.E., Piniak, W.E.D., Weir, C.R., Godley, B.J., 2016. '*Seismic surveys and marine turtles: An underestimated global threat?*' Biological Conservation, 193:49-65. https://doi.org/10.1016/j.biocon.2015.10.020.

Nicol, D.J., 1987. '*A Review and Update of the Tasmanian Cetacean Stranding Record to the end of February 1986*'. University of Tasmania Environmental Studies Working Paper. 21:96 pp.

Nieblas, A-E., Sloyan, B.M., Hobday, A.J., Coleman, R., Richardson, A.J., 2009. '*Variability of biological production in low wind-forced regional upwelling systems: a case study off southeastern Australia*'. Limnol. Oceanogr., 54(5): 1548 – 1558.

Nielsen, M.L., Bejder, L., Videsen, S.K., Christiansen, F., Madsen, P.T., 2019. '*Acoustic crypsis in southern right whale mother-calf pairs: infrequent, low-output calls to avoid predation?*'. Journal of Experimental Biology, 222(13): jeb190728.

NMSC, 2009. '*National boating usage study – preliminary survey report*'. National Marine Safety Committee, December 2009, 84p.

National Oceanic and Atmospheric Administration (NOAA), 2018. '*Fin whale*'. https://www.fisheries.noaa.gov/species/fin-whale

National Oceanic and Atmospheric Administration (NOAA), 2019. '*ESA Section 7 Consultation Tools for Marine Mammals on the West Coast*' (webpage), 27 Sep 2019. https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-consultation-tools-marine-mammals-west. Accessed March 2022.

National Oceanic and Atmospheric Administration (NOAA), 2012. *'Small Diesel Spills (500 – 5,000 gallons)'*. Office of Response and Restoration.

National Oceanic and Atmospheric Administration (NOAA), 2022. '*How oil harms animals and plants in marine environments*'. https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/how-oil-harms-animals-and-plants-marine-environments.html Accessed April 2023.

Noad, M.J., Cato, D.H., 2001. '*A combined acoustic and visual survey of humpback whales off southeast Queensland*'. Memoirs of the Queensland Museum, 47(2): 507 – 523.

Noad, M.J., Dunlop, R.A., Paton, D., Cato, D.H., 2008. '*An update of the east Australian humpback whale population (E1) rate of increase*'. Paper submitted to the International Whaling Commission Scientific Committee, SC/60/SH31, 13p.

NOO, 2001. '*Pressures on uses in the South-east Marine Region*'. National Oceans Office. https://parksaustralia.gov.au/marine/pub/scientific-publications/archive/pressures-uses.pdf

NOPSEMA, 2019. *Bulletin #1 Oil Spill Modelling*, April 2019. Available at https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf, accessed March 2022.

Norris, K.S., Mohl, B., 1983. '*Can odontocetes debilitate prey with sound*?'. The American Naturalist, 122(1), pp.85-104.

Nousek McGregor, A.E., 2010. '*The cost of locomotion in North Atlantic right whales Eubalaena glacialis*'. PhD Thesis, Dissertation, Duke University.

Nowacek, D.P., Thorne, L.H., Johnston, D.W., Tyack, P.L., 2007. '*Responses of cetaceans to anthropogenic noise*'. Mammal Rev., 37(2):81-115.

O'Connor, J.J., Fobert, E.K., Besson, M., Jacob, H., Lecchini, D., 2019. '*Live fast, die young: Behavioural and physiological impacts of light pollution on a marine fish during larval recruitment*'. Marine Pollution Bulletin, vol. 146, p. 908-914. September 2019. https://doi.org/10.1016/j.marpolbul.2019.05.038.

O'Hara, P.D., Morandin, L.A., 2010. '*Effects of sheens associated with offshore oil and gas development on the feather microstructure of pelagic seabirds*'. Marine Pollution Bulletin, 60(5): 672 – 678.

O'Shea, T.J., Poche, L.B., 2006. '*Aspects of underwater sound communication in Florida manatees (Trichechus manatus latirostris)*'. Journal of Mammalogy 87(6): 1061-1071.

Ocean Research Group, 2015. '*Sperm Whales*'. http://www.oceanicresearch.org/education/wonders/spermwhales.htm

Odell, D.K., McClune, K.M., 1999. '*False killer whale Pseudorca crassidens (Owen 1846)*'. **In:** Ridgway, S.H. & R. Harrison, eds. Handbook of Marine Mammals. Vol. 6: The second book of dolphins and the porpoises. Page(s) 213-243. Academic Press, San Diego.

OGP, I., 2011. '*An overview of marine seismic operations*' (Report No. 448) (I. A. o. G. Contractors, Trans.). **In**: I. A. o. O. a. G. Producers (Ed.), (pp. 50). London.

Oleson, E.M., Calambokidis, J., Burgess, W.C., McDonald, M.A., LeDuc, C.A., Hildebrand, J.A., 2007. '*Behavioural context of call production by eastern North Pacific blue whales*'. Marine Ecology Progress Series, 330: 269 – 284.

O'Neill, C., Leary, D., McCrodan, A., 2010. 'Sound Source Verification. (Chapter 3)' In Blees, M.K., K.G. Hartin, D.S. Ireland, and D. Hannay (eds.). 'Marine mammal monitoring and mitigation during open water seismic exploration by Statoil USA E&P Inc. in the Chukchi Sea, August-October 2010: 90-day report'. LGL Report P1119. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Applied Sciences Ltd. for Statoil USA E&P Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. 1-34.

ORCV, 2023. '*King Island Ocean Yacht Race*'. https://www.orcv.org.au/king-island-about-the-race

Ovenden, J.R., Tillett, B.J., Macbeth, M., Broderick, D., Filardo, F., Street, R., Tracey, S.R., Semmens, J., 2016. *'Stirred but not shaken: population and recruitment genetics of the scallop (Pecten fumatus) in Bass Strait, Australia'*. ICES Journal of Marine Science, 73(9), pp.2333-2341.

Papirmeister, B., Feister, A. F.; Robinson, S. I., et al. 1991. '*Medical Defense against Mustard Gas: Toxic Mechanisms and Pharmacological Implications*'. CRC Press: Boca Raton, FL.

Parks, S., Clark, C., Tyack, P., 2007. '*Short- and long-term changes in right whale calling behaviour: the potential effects of noise on acoustic communication*'. Journal of the Acoustical Society of America, 122(6): 3725 – 3731

Parks, S., Johnson, M., Nowacek, D., Tyack, P., 2011. '*Individual right whales call louder in increased environmental noise*'. Biology letters, 7: 33 – 35

Parks, S.E., Cusano, D.A., Van Parijs, S.M. & Nowacek, D.P. 2019. '*Acoustic Crypsis in Communication by North Atlantic Right Whale Mother–Calf Pairs on the Calving Grounds*'. Biology Letters 15, 10, 20190485. doi: https://doi.org/10.1098/rsbl.2019.0485.

Parks, S.E., Tyack, P.L., 2005. '*Sound production by North Atlantic right whales (Eubalaena glacialis) in surface active groups'*. Journal of the Acoustical Society of America, 117: 3297 – 3306.

Parnell, P.Ed., 2003. '*The effects of sewage discharge on water quality and phytoplankton of Hawai'ian coastal waters'*. Marine Environmental Research, 55(4): 293 – 311.

Parry G.D., Heislers S., Werner G.F., Asplin M.D., Gason A. 2002. *'Assessment of environmental effects of seismic testing on scallop fisheries in Bass Strait'*. Marine and Freshwater Resources Institute Report No. 50. Marine and Freshwater Institute, Queenscliff, Victoria.

Parry, G.D., Gason, A., 2006. '*The effect of seismic surveys on catch rates of rock lobsters in western Victoria, Australia'*. Fisheries Research, 79:272 – 284

Parvin, S., 2005. '*Limits for underwater noise exposure of human divers and swimmers'*. http://resource.npl.co.uk/docs/science_technology/acoustics/clubs_groups/13oct05_seminar/parvin_subacoustech.pdf

Parvin, S.J., 1998. '*The effects of low frequency underwater sound on divers'*. Proceedings of Undersea Defence Technology, Nexus media Ltd, Wembley, London.

Patenaude, N.J., Portway, V.A., Schaeff, C.M., Bannister, J.L., Best, P.B., Payne, R.S., Rowntree, V.J., Rivarola, M., Baker, C.S., 2007. '*Mitochondrial DNA diversity and population structure among southern right whale (Eubalaena australis)'*. Journal of Heredity, 98(2): 147 – 157.

Patterson, H., Bromhead, D., Galeano, D., Larcombe, J., Woodhams, J., Curtotti, R., 2021. '*Fishery status reports 2021'*. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/vahf-ng93.

Patterson, T.A., Evans, K., Carter, T.I., Gunn, J.S., 2008. '*Movement and behaviour of large southern bluefin tuna (Thunnus maccoyii) in the Australian region determined using pop-up satellite archival tags'*. Fish. Oceanog., 17: 352 – 367.

Patterson, T.A., Eveson, J.P., Hartog, J.R., Evans, K., Cooper, S., Lansdell, M., Hobday, A.J., Davies, C.R., 2018. '*Migration dynamics of juvenile southern bluefin tuna'*. Scientific Reports, 8, 14553.

Paulay, G., Kirkendale, L., Lambert, G., Meyer, C., 2002. '*Anthropogenic Biotic Interchange in a Coral Reef Ecosystem: A Case Study from Guam*'. Pacific Science. 56. 10.1353/psc.2002.0036.

Paxton, A.B., Taylor, J.C., Nowacek, D.P., Dale, J., Cole, E. Voss, C.M., Peterson, C.H., 2017. '*Seismic survey noise disrupted fish use of a temperate reef*'. Marine Policy 78: 68-73.

Payne, J.F. 2004. '*Potential effect of seismic surveys on fish eggs, larvae and zooplankton'*. CSAS Research Document 2004/125. Canadian Science Advisory Secretariat, Department of Fisheries and Oceans, Canada.

Payne, J.F., Andrews, C., Fancey, L., White, D., Christian, J., 2008. '*Potential effects of seismic energy on fish and shellfish: an update since 2003*'. Report Number 2008/060. Canadian Science Advisory Secretariat, Canada.

Payne, J.F., Andrews, C.A., Fancey, L.L., Cook, A.L., Christian, J.R. 2007. '*Pilot study on the effects of seismic air gun noise on lobster (Homarus americanus)*'. Report No. 171. Environmental Studies Research Funds, St. John's, Canada.

Payne, J.F., C. Andrews, L. Fancey, D. White, J. Christian. 2008. '*Potential effects of seismic energy on fish and shellfish: an update since 2003'*. Report Number 2008/060. Canadian Science Advisory Secretariat, Canada.

Pearson, W.H., Skalski, J.R, Malme, C.I., 1992. '*Effects of sounds from a geophysical survey device on behaviour of captive rockfish (Sebastes spp.)*'. Canadian Journal of Aquatic Science 49(7): 1343–1356.

Pearson, W.H., Skalski, J.R., Sulkin, S.D., Malme, C.I. 1994. '*Effects of seismic releases on the survival of development of zoeal larvae of dungeness crab (Cancer magister)*'. Marine Environmental Research 38: 93-113.

Peel, D., Smith, J.N., Childerhouse, S., 2018. '*Vessel strike of whales in Australia: the challenges of analysis of historical incident data*'. Front. Mar. Sci., 5:69.

Peel., D., Smith., J.N., Childerhouse, S., 2016. '*Historical data on Australian whale vessel strikes*'. Presented to the IWC Scientific Committee. SC/66b/HIM/05.

Peña, H., Handegard, N. O., Ona, E. 2013. '*Feeding herring schools do not react to seismic air gun surveys*'. ICES Journal of Marine Science 70(6): 1174–1180.

Pendoley, K.L., 2005. '*Sea turtles and the environmental management of industrial activities in north-west Western Australia*'. Ph.D. Thesis, Murdoch University: Perth.

Perić, T., 2016. '*Wastewater Pollution from Cruise Ships in Coastal Sea Area of the Republic of Croatia*'. Scientific Journal of Maritime Research, 30:160-164.

Perrin, W.F., Brownell, R.L., 2002. '*Minke Whales Balaenoptera acutorostrata and B. bonaerensis*'. In: Perrin W.F., Würsig B., Thewissen, H.G.M., (eds.) Encyclopedia of Marine Mammals. Page(s) 750-754. Academic Press.

Pestorius, F.M., Cudahy, E.A., Fothergill, D.M., 2009. '*Evolution of navy diver exposure standards for deterministic underwater sound in the 100-500 hertz band*'. In Proceedings of Meetings on Acoustics 158ASA (Vol. 8, No. 1, p. 070002). Acoustical Society of America.

Petrella, V., Martinez, E., Anderson, M., Stockin, K., 2012. '*Whistle characteristics of common dolphins (Delphinus sp.) in the Hauraki Gulf, New Zealand*'. Marine Mammal Science, 28: 479 - 496.

Picciulin, M., Sebastianutto, L., Codarin A., Calcagno, G., Ferrero, E.A., 2012. '*Brown Meagre Vocalization Rate Increases During Repetitive Boat Noise Exposures: A Possible Case Of Vocal Compensation*'. Journal of the Acoustical Society of America, 132:3118–3124.

Pichegru, L., Nyengera, R., McInnes, A.M., Pistorius, P., 2017. '*Avoidance of seismic survey activities by penguins*'. Scientific Reports, 7:16305, doi:10.1038/s41598-017-16569-x.

Pickett, G., Eaton, D., Seaby, R., Arnold, G., 1994. '*Results of bass tagging in Poole Bay during 1992*'. Ministry of Agriculture Fisheries and Food.

Pine, M.K., Nikolich, K., Martin, B., Morris, C., Juanes, F., 2020. '*Assessing auditory masking for management of underwater anthropogenic noise*'. J. Acoust. Soc. Am., 147(5): 3408 – 3417.

Pirotta, E., Booth, C., Cade, D., Calambokidis, J., Costa, D., Fahlbusch, J., Friedlaender, A., Goldbogen, J., Harwood, J., Hazen, E., New, L., Southall, B. 2021. '*Context-dependent variability in the predicted daily energetic costs of disturbance for blue whales*'. Conservation Physiology: doi:10.1093/conphys/coaa13.

PIRSA, 2023. '*Commercial Fishing*'. http://www.pir.sa.gov.au/fishing/commercial_fishing

Pirzl, R., 2008. '*Spatial ecology of Eubalaena australis: habitat selection at multiple scales*'. PhD Thesis, School of Life and Environmental Sciences, Deakin University, Melbourne.

Pirzl, R., Patenaude, N.J., Burnell, S., Bannister, J., 2009. '*Movements of southern right whales (Eubalaena australis) between Australian and subantarctic New Zealand population*'. Mar. Mamm. Sci. 25(2): 455–61.

Plotkin, P.T., Wicksten, M.K., Amos, A.F., 1993. '*Feeding ecology of the loggerhead sea turtle Caretta caretta in the northwestern Gulf of Mexico*'. Marine Biology, 115(1).

Plunkett, G., 2003. '*Sea dumping in Australia. Historical and contemporary aspects*'. Published by the Department of Defence, Australia, 2003, 128p.

Plunkett, G., 2018. '*Chemical munitions. Sea dumping off Australia*'. Forth edition, Published by the Department of Defence, Australia, 59p.

Pogonoski, J.J., Pollard, D.A., Paxton, J.R., 2002. '*Conservation overview and action plan for Australian threatened and potentially threatened marine and estuarine fishes*'. Canberra, ACT: Environment Australia.

Pomilla, C., Rosenbaum, H.C., 2005. '*Against the current: an inter-oceanic whale migration event*'. Biology Letters, 1: 476 – 479.

Poore, G.C.B., Wilson, R.S., Gomon, M., Lu, C.C., 1985. '*Museum of Victoria Bass Strait Survey, 1979-1984*'. Museum of Victoria: Melbourne.

Popov, V., Supin, A., Rozhnov, V., Nechaev, D., Sysuyeve, E., Klishin, V., Pletenko, M., Tarakanov, M., 2013. '*Hearing threshold shifts and recovery after noise exposure in Beluga whales, Delphinapterus leucas*'. The Journal of Experimental Biology 216: 1587-1596.

Popper A.N., 2003. '*Effects of Anthropogenic Sounds on Fishes*'. Fisheries, 28(10):24-31.

Popper, A., Hastings, M., 2009. '*The effects of anthropogenic sources of sound on fishes*'. Journal of Fish Biology, 75:455-489.

Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., Lokkeborg, S., Rogers, P., Southall, S., Zeddies, D., Tavlga, W., 2014. '*Sound exposure guidelines for fishes and sea turtles*'.

Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., Lokkeborg, S., Rogers, P., Southall, S., Zeddies, D., Tavlga, W., 2014. '*Sound exposure guidelines for fishes and sea turtles*'. A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Acoustical Society of America and Springer Press. 88 pp.

Popper, A.N., Carlson, T.J., Hawkins, A.D., Southall, B.L., Gentry, R.L., 2006. '*Interim criteria for injury of fish exposed to pile driving operations: a white paper*'. https://www.researchgate.net/publication/237374178_Interim_Criteria_for_Injury_of_Fish_Exposed_to_Pile_Driving_Operations_A_White_Paper >.

Popper, A.N., Dale, J., Gray, M.D., Keith, W., Block, B., Rogers, P.H., 2013. '*Threshold of hearing for swimming Bluefin tuna (Thunnus orientalis*)'. Proceedings of Meetings on Acoustics, vol. 19.

Popper, A.N., Gross, J.A., Carlson, T.J., Skalski, J., Young, J.V., Hawkins, A.D., Zeddies, D., 2016. '*Effects of Exposure to the Sound from seismic airguns on pallid sturgeon and paddlefish*'. PLoS One 11(8): e0159486.

Popper, A.N., Hawkins, A.D., 2018. '*The importance of particle motion to fishes and invertebrates*'. The Journal of the Acoustical Society of America, 143(1), pp.470-488.

Popper, A.N., Hawkins, A.D., 2019. '*An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes*'. Journal of fish biology, 94(5), pp.692-713.

Popper, A.N., Hoxter, B., 1984. '*Growth of a fish ear: 1. Quantitative analysis of hair cell and ganglion cell proliferation.*' Hear. Res. 15, 133–142.

Popper, A.N., Smith, M.E., Cott, P.A., Hanna, B.W., MacGillivary, A.O., Austin, M.E., Mann, D.A., 2005. 'Effects of exposure to seismic airgun use on hearing of three fish species'. J. Acoust. Soc. Am., 117(6): 3958 – 3971.

Primary Industries and Regions SA (PIRSA), 2014. '*Management Plan for the South Ausralian Commercial Marine Scalefish Fishery. Part B – Management Arrangements for the Taking of Sardines*'. 89p.

Primary Industries and Regions SA (PIRSA), 2023a. '*Marine Scalefish Fishery*'. https://pir.sa.gov.au/primary_industry/commercial_fishing/commercial_fisheries/marine_scalefish_fishery

Primary Industries and Regions SA (PIRSA), 2023b. '*Marine scalefish fishery reform*'. https://pir.sa.gov.au/primary_industry/commercial_fishing/commercial_fisheries/marine_scalefish_fishery/reform

Primary Industries and Regions SA (PIRSA), 2023c. '*Abalone Fishery*'. https://pir.sa.gov.au/primary_industry/commercial_fishing/commercial_fisheries/abalone_fishery

Primary Industries and Regions SA (PIRSA), 2023d. '*Miscellaneous Fishery*'. https://pir.sa.gov.au/primary_industry/commercial_fishing/commercial_fisheries/miscellaneous_fishery

Prince, J.D., 2005. '*Combating the tyranny of scale for Haliotids: micro-management for micro-stocks*'. Bulletin of Marine Science 76: 557-577.

Prince, L.T., 2004. '*Stranding of small juvenile leatherback in Western Australia*'. Marine Turtle Newsletter 104:3-5.

Prince, R.I., 1994. '*Status of the Western Australian marine turtle populations: the Western Australian Marine Turtle Project 1986-1990'*. In: Russell, J., ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 1-14. Queensland Department of Environment and Heritage. Canberra, ANCA

Przeslawski, R., Brooke, B., Carroll, A.G., Fellows, M., 2018. '*An integrated approach to assessing marine seismic impact: Lessons learnt from the Gippsland Marine Environmental Monitoring project*'. Ocean and Coastal Management, 160:117-123.

Przeslawski, R., Bruce, B., Carroll, A., Anderson, J., Bradford, R., Durrant, A., Edmunds, M., Foster, S., Huang, Z., Hurt, L., Lansdell, M., Lee, K., Lees, C., Nichols, P., Williams, S. 2016. *'Marine seismic survey impacts on fish and invertebrates: final report for the Gippsland marine environmental monitoring project'*. Record 2016/35. Geoscience Australia, Canberra, ACT.

Przeslawski, R., Huang, Z., Anderson J., Carroll, A.G., Edmunds, M., Hurt, L., Williams, S., 2018. '*Multiple field-based methods to assess the potential impacts of seismic surveys on scallops'*. Marine Pollution Bulletin 129(2):750-761.

Putland, R.L., Merchant, N.D., Farcas, A., Radford, C.A., 2017. '*Vessel noise cuts down communication space for vocalising fish and marine mammals'*. Global Change Biol., 24: 1708 – 1721.

Racca, R., A. Rutenko, K. Bröker, Gailey, G., 2012b. '*Model based sound level estimation and in-field adjustment for real-time mitigation of behavioural impacts from a seismic survey and post-event evaluation of sound exposure for individual whales'*. Acoustics 2012 Fremantle: Acoustics, Development and the Environment, Fremantle, Australia. http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p92.pdf.

Racca, R., A. Rutenko, K. Bröker, M. Austin. 2012a. *'A line in the water - design and enactment of a closed loop, model based sound level boundary estimation strategy for mitigation of behavioural impacts from a seismic survey. 11th European Conference on Underwater Acoustics 2012'*. Volume 34(3), Edinburgh, United Kingdom.

Racca, R., Austin, M.E., Rutenko, A.N., Broker, K., 2015. '*Monitoring the gray whale sound exposure mitigation zone and estimating acoustic transmission during a 4-D seismic survey, Sakhalin Island, Russia'*. Endangered Species Research 29(2):131-146.

Radford, A., Kerridge, E., Simpson, S., 2014. '*Acoustic Communication In A Noisy World: Can Fish Compete With Anthropogenic Noise?'*. Behavioural Ecology, 25(5):1022-1030.

Reddy, G., Major, M.A., Leach, G.J., 2005. '*Toxicity assessment of thiodiglycol'*. International Journal of Toxicology, 24: 435 – 442.

Reeves, R., Pitman, R.L., Ford, J.K.B., 2017. *Orcinus orca*. The IUCN Red List of Threatened Species 2017: e.T15421A50368125. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T15421A50368125.en

Rennie, S.J., Pattiaratchi, C.B., McCauley, R.D., 2007. '*Eddy formation through the interaction between the Leeuwin current, Leeuwin undercurrent and topography'*. Deep-sea Research Part II: Topical Studies in Oceanography, 54: 818 – 836.

Rice, D.W.,1989. Sperm whale Physeter macrocephalus. In: Ridgway, S.H. & R. Harrison, eds. Handbook of Marine Mammals Vol. 4: River Dolphins and the Larger Toothed Whales. Page(s) 177-233

Richardson, A.J., Matear, R.J., Lenton, A., 2017. '*Potential impacts on zooplankton of seismic surveys'*. Commonwealth Scientific Industrial Research Organisation, Canberra, Australia.

Richardson, J., Greene, C,, Malme, C., Thomson, D., 1995. '*Marine Mammals and Sound'*. Academic Press, Waltham.

Richardson, L.E., Middleton, J.F., Kyser, T.K., James, N.P., Opdyke, B.N., 2019. '*Shallow water masses and their connectivity along the southern Australian continental margin*'. Deep Sea Research Part I: Oceanographic Research Papers, 152: 103083

Ridgway, K.R., Condie, S.A., 2004. '*The 5500-km-long boundary flow off western and southern Australia*'. Journal of Geophysical Research, 109, doi:10.1029/2003JC002921.

Ridgway, S.H., 1983. '*Dolphin hearing and sound production in health and illness*'. Pages 247–296 in R. R. Fay and G. Gourevitch, eds. Hearing and other senses: Presentations in honor of E. G. Weaver. The Amphora Press, Groton, CT.

Riekkola, L., Childerhouse, S.J., Zerbini, A., Andrews-Goff, V., Constantine, R., Cole, R., Stuck, E. & Carroll, E.L. 2021. '*An Unexpected Journey: Tracking Southern Right Whales from the New Zealand Subantarctic Wintering Grounds'*. Report to the International Whaling Commission document SC/68C/SH/02 Rev 1.

Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B., Winker, H., 2019a. '*Isurus oxyrinchus'*. The IUCN Red List of Threatened Species. e.T39341A2903170.

Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W.,Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B., Winker, H., 2019b. '*Lamna nasus*'. The IUCN Red List of Threatened Species 2019: e.T11200A500969

Risch, D., Corkeron, P.J., Ellison, W.T., van Parijs, S.M., 2012. '*Changes in humpback whale song occurrence in response to an acoustic source 200 km away'*. PLoS One, 7(1): doi:10.1371/journal.pone.0029741.

Robbins, J., Dalla Rosa, L., Allen, J.M., Mattila, D.K., Secchi, E.R., Friedlaender, A.S., Stevick, P.T., Nowacek, D.P., Steel, D., 2011. '*Return movement of a humpback whale between the Antarctic Peninsula and American Samoa: a seasonal migration record'*. Endangered Species, 13: 117 – 121.

Roberts, L., Elliot, M., 2017. '*Good or bad vibrations? Impacts of anthropogenic vibration on the marine epibenthos. Effects of underwater noise on fish and invertebrates'*. Science of the Total Environment, 595(1): 255 – 268.

Roberts, L., Harding, H.R., Voellmy, I., Bruintjes, R., Simpson, S.D., Radford, A.N., Breithaupt, T., Elliott, M., 2016. '*Exposure of benthic invertebrates to sediment vibration: from laboratory experiments to outdoor simulated pile-driving'*. Proceedings of Meetings on Acoustics, 27: 010029.

Robertson, P, Coventry, A.J., 2019. '*Reptiles of Victoria – a guide to identification and ecology'*. CSIRO publishing.

Robins, C.M, Sali, J.B., Kalish, S.R., 2002. '*Bycatch of sea Turtles in Pelagic Longline Fisheries – Australia*'. Fisheries Resources Research Fund, Canberra: Bureau of Rural Sciences

Rogers, P., Debusschere, E., de Haan, D., Martin, B., Slabbekoorn, H., 2021. '*North Sea soundscapes from a fish perspective: directional patterns in particle motion and masking potential from anthropogenic noise'*. J. Acoust. Soc. Am., 150(3): 2174 – 2188.

Rolland, R.M., Parks, S.E., Hunt, K.E., Castellote, M., Corkeron, P.J., Nowacek, D.P., Wasser, S.K., Kraus, S.D., 2012. '*Evidence that ship noise increases stress in right whales'*. Proc. R. Soc. B., 279: 2363 – 2368.

Romano, T.A., Keogh, M.J., Kelly, C., Feng, P., Berk, L., Schlundy, C.E., Carder, D.A., Finneran, J.J., 2004. '*Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure'*. Can. J. Fish. Aquat. Sci., 61: 1124 – 1134.

Ronconi, R.A., Allard, K.A., Taylor, P.D., 2015. '*Bird interactions with offshore oil and gas platforms: review of impacts and monitoring techniques'*. Journal of Environmental Management, 147: 34 – 45.

Ross, G.J.B., 2006. '*Review of the Conservation Status of Australia's Smaller Whales and Dolphins'*. Report to the Australian Department of the Environment and Heritage, Canberra, 124p.

Rowe, S., 2007. '*A review of methodologies for mitigating incidental catch of protected marine mammals'.* DOC Research and Development Series 283. Department of Conservation, Wellington.

Rowling, K.R., Makin, D.L., 2001. '*Monitoring of the fishery for Gemfish Rexea solandri, 1996 to 2000. AFMA Research Project No. 99/337'.* Cronulla, NSW: Fisheries Research Institute.

RPS 2023. TGS SLB Otway Basin 3D Multi-Client MMS - Oil Spill Modelling. March 2023

Sætre, R., Ona, E., 1996. '*Seismic investigations and harmful effects on fish eggs and larvae. An assessment of the possible effects on the level of recruitment'*. Fisken og Havet, Havforskningsinstituttet, Bergen, Norway.

Salgado Kent, C., McCauley, R.D., Duncan, A., Erbe, C., Gavrilov, A., Lucke, K., Parnum, I. 2016. '*Underwater sound and vibration from offshore petroleum activities and their potential effects on marine fauna: an Australian perspective'*. Centre for Marine Science and Technology, Curtin University, Perth, WA.

Sanderson, H., Fauser, P., Thomsen, M., Vanninen, P., Soderstrom, M., Savin, Y., Khalikov, I., Hirvonen, A., Niiranen, S., Missiaen, T., Gress, A., Borodin, P., Medvedeva, N., Polyak, Y., Paka, V., Zhurbas, V., Feller, P., 2010. *'Environmental hazards of sea-dumped chemical weapons'*. Environ. Sci. Technol., 44: 4389 – 4394.

Sandery, P.A., Kampf, J., 2005. '*Winter Spring flushing of Bass Strait, South Eastern Australia; Numerical modelling study*'. Estuarine and coastal shelf science, 63.

Santos., 2004. '*Casino Gas Field Development Environment Report*'. Prepared by Enesar Consulting Pty Ltd. Hawthorn East, Victoria

Santulli, A., Modica, A., Messina, C., Ceffa, L., Curatolo, A., Rivas, G., Fabi, G., D'Amelio, V., 1999. '*Biochemical responses of European Sea Bass (Dicentrarchus labrax L.) to the stress induced by off shore experimental seismic prospecting*'. Marine Pollution Bulletin 38: 1105–1114.

SARDI, 2017. '*SARDI strategic plan 2018 – 2023, November 2017*'. Accessed from http://www.pir.sa.gov.au/__data/assets/pdf_file/0004/300856/SARDI_Strategic_Plan_2018-23.pdf

Sarnocinska, J., Teilmann, J., Dalgaard Balle, J., van Beest, F., Delefosse, M., Tougaard, J., 2020. '*Harbor Porpoise (Phocoena phocoena) Reaction to a 3D Seismic Airgun Survey in the North Sea*'. Frontiers of Marine Science. 6:824. doi: 10.3389/fmars.2019.00824.

Saunders, R., Royer, F., Clarke, M., 2011. '*Winter migration and diving behaviour of porbeagle shark, Lamna nasus, in the northeast Atlantic*'. ICES Journal of Marine Science, 68(1): 166 – 174.

Schahinger, R.B., 1987. '*Structure of coastal upwelling events observed off the south-east coast of South Australia during February 1983-April 1984*'. Australian Journal of Marine and Freshwater Research 38: 439-459.

Schlacher, T.A., Williams, A., Althaus, F., Schlacher-Hoenlinger, M.A., 2010. '*High-resolution seabed imagery as a tool for biodiversity conservation planning on continental margins*'. Marine Ecology, 31(1), 200-221.

Scholik, A.R., Yan, H.Y., 2001. '*Effects of underwater noise on auditory sensitivity of a cyprinid fish*'. Hearing Research 152:17–24.

Schreck, C., Tort, L., Farrell, A.P., *et al*., 2016. '*Biology of stress in fish*'. Academic Press, Cambridge.

Schuck J.B., Smith M.E., 2009. '*Cell proliferation follows acoustically-induced hair cell bundle loss in the zebrafish saccule*'. Hear. Res. 253, 67–76. 10.1016/j.heares.2009.03.008

Schwacke, L.H., Smith, C.R., Townsend, F.I., Wells, R.S., Hart, L.B., Balmer, B.C., Collier, T.K., De Guise, S., Fry, M.M., Guillette, L.J., Lamb, S.V., Lane, S.M., McFee, W.E., Place, N.J., Tumlin, M.C., Ylitalo, G.M., Zolman, E.S., Rowles, T.K., 2013. '*Health of common bottlenose dolphins (Tursiops truncatus) in Barataria Bay, Louisiana, following the Deepwater Horizon oil spill*'. Environmental Science & Technology, 48: 93 – 103.

Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V., Garthe, S., 2011. '*Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning*'. Ecological Applications, 21(5): 1851 – 1860.

Senigaglia, V., Christiansen, F., Bejder, L., Gendron, D., Lundquist, D., Noren, D.P., Schaffar, A., Smith, J.C., Williams, R., Martinez, E., Stockin, K., Lusseau, D., 2016. '*Meta-analyses of whale-watching impact studies: comparisons of cetacean responses to disturbance*'. Marine Ecology Progress Series 542:251–263. DOI: https://doi.org/10.3354/meps11497.

Shaughnessy, P., Briggs, S., Constable, R., 2001. '*Observations on seals at Montague Island, New South Wales*'. Australian Mammalogy, 23: 1 – 7.

Shaughnessy, P., Goldsworthy, S., Hamer, D., Page, B., McIntosh, R., 2011. '*Australian sea lions Neophoca cinerea at colonies in South Australia: distribution and abundance, 2004 to 2008*'. Endangered Species Research, 13: 87 – 98.

Shaughnessy, P.D., 1999. '*The action plan for Australian seals*'. Environment Australia, Canberra. Available from: www.environment.gov.au. Accessed 04/05/2021.

Shaughnessy, P.D., Goldsworthy, S.D., 2020. '*Dispersion of long-nosed fur seals (Arctocephalus forsteri) determined by tagging*'. Australian Journal of Zoology 67(3): 173-179.

Shaughnessy, P.D., Goldsworthy, S.D., Mackay, A.I., 2015. '*The long-nosed fur seal (Arctocephalus forsteri) in South Australia in 2013-2014: abundance, status and trends*'.

Simmonds, J.E., MacLennan, D., 2005. '*Fisheries acoustics: theory and practice*'. Second edition. Blackwell Science, Oxford, United Kingdom.

Simmonds, M., Dolman, S., and Weilgart, L 2004. '*Oceans of Noise 2004*.' A Whale and Dolphin Conservation Science Report.

Simonis, A.E., Brownell, R.L., Thayre, B.J., Trickey, J.S., Oleson, E.M., Huntington, R., Baumann-Pickering, S., 2020. '*Co-occurrence of beaked whale strandings and naval sonar in the Mariana Islands, Western Pacific*'. Proc. R. Soc. B., 287.

Širović, A., Hildebrand, J.A., Wiggins, S.M., 2007. '*Blue and fin whale call source levels and propagation range in the Southern Ocean*'. Journal of the Acoustical Society of America, 122(2): 1208 – 1215.

Sivle, L.D., Hansen, R.R., Karlsen, H.E. and Handegard, N.O., 2016. '*Mackerel behaviour and seismic signals – a pilot net pen study*'. Report for Havforsknings instituttet, Institute of Marine Research, Bergen, Norway.

Skalski, J., Pearson, W., Malme, C., 1992. '*Effects of sounds from a geophysical device on catch-per-unit-effort in a hook-and-line fishery for rockfish (Sebastes spp.)'.* Canadian Journal of Fisheries and Aquatic Sciences, 49: 1357-1365.

Skaret, G., Axelsen, B.E., Mottestad, L., Ferno, A., Johannessen, A., 2005. '*The behaviour of spawning herring in relation to a survey vessel*'. ICES Journal of Marine Science, 62:1061-1064.

Slotte, A., Hansen, K., Dalen, J., Ona, E., 2004. '*Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast*'. Fisheries Research 67(2): 143-150.

Smart, J.J., Earl, J., McGarvey, R., Feenstra, J., Drew, M.J., Bailleul, F., Fowler, A.J., Matthews, D., Chaplin, G., Matthrews, J.M., Freeling, B., Rogers, T.A., Beckman, C.L., Tsolos, A., 2022. '*Assessment of the South Australian Marine Scalefish Fishery in 2020*'. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000427-5. SARDI Research Report Series No. 1162. 266pp.

Smith M.E., Schuck J.B., Gilley R.R., Rogers B.D., 2011. '*Structural and functional effects of acoustic exposure in goldfish: evidence for tonotopy in the teleost saccule*'. BMC Neurosci. 12:19. 10.1186/1471-2202-12-19

Smith, J., Jones, D., Travouillon, K., Kelly, N., Double, M., Bannister, J.L., 2019. '*Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia 2018-2021 - Final Report on activities for 2018*'. Report to the National Environmental Science Program, Marine Biodiversity Hub. Western Australian Museum (lead organisation). p. 20.

Smith, J.N., Grantham, H.S., Gales, N., Double, M.C., Noad, M.J., Paton, D., 2012. '*Identification of humpback whale breeding and calving habitat in the Great Barrier Reef*'. Marine Ecology Progress Series, 447: 259 – 272.

Smith, M.E., Coffin, A.B., Miller, D.L., Popper, A.N., 2006. '*Anatomical and functional recovery of the goldfish (Carassius auratus) ear following noise exposure*'. Journal of Experimental Biology 209:4193–4202.

Smyth, D., Isherwood, M., 2016. '*Protecting sea country: Indigenous people and marine protected areas in Australia. Big, Bold and Blue: Lessons from Australia's marine protected areas*'. pp.307-325.

Solan, M., Hauton, C., Godbold, J. A., Wood, C. L., Leighton, T. G., White, P., 2016. '*Anthropogenic sources of underwater sound can modify how sediment-dwelling invertebrates mediate ecosystem properties*'. Scientific reports, 6, 20540.

Soldevilla, M.S., Henderson, E.E., Campbell, G.S., Wiggins, S.M., Hildebrandt J.A., Roch, M.A., 2008. '*Classification of Risso's and Pacific white-sided dolphins using spectral properties of echolocation clicks*'. The Journal of the Acoustical Society of America, 124:609–624.

Solé, M., Lenoir, M., Durfort, M., López-Bejar, M., Lombarte, A., Van der Schaar, M., André, M., 2013a. '*Does exposure to noise from human activities compromise sensory information from cephalopod statocysts?*'. Deep Sea Research Part II: Topical Studies in Oceanography, *95*, 160-181.

Solé, M., Lenoir, M., Durfort, M., López-Bejar, M., Lombarte, A., André, M., 2013b. '*Ultrastructural damage of Loligo vulgaris and Illex coindetii statocysts after low frequency sound exposure*'. PLoS One, 8(10), e78825.

Song, J., Mathieu, A., Soper, R.F., Popper, A.N., 2006. '*Structure of the inner ear of bluefin tuna Thunnus thynnus*'. J Fish Biol, 68: 1767 – 1781.

Sørensen, K., Neumann, C., Dahne, M., Hansen, K.A., Wahlberg, M., 2020. '*Gentoo penguins (pygoscelis papua) react to underwater sounds*'. Royal Society Open Science, 7(2): 191988.

Southall, B.L., 2005. '*Shipping noise and marine mammals: a forum for science, management, and technology*'. Final report of the 2004 NOAA symposium "shipping noise and marine mammals", 40p.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., Tyack, P.L., 2007. '*Marine mammal sound exposure criteria: Initial scientific recommendations*'. Aquatic Mammals 33(4): 411-509.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowle,s A.E., Ellison, W.T., Nowacek, D.P., Tyack, P.L., 2019. '*Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*'. Aquatic Mammals 45(2): 125-232.

Southall, B.L., Hatch, L., 2008. *'Impacts of Anthropogenic Underwater Sound in the Marine Environment, Module 5: Shipping*' OSCPAR Convention for the protection of the marine environment of the north-east Atlantic, Draft preliminary comprehensive overview of the impacts of anthropogenic underwater sound in the marine environment.

Southall, B.L., Nowacek, D.P., Bowles, A.E., Senigaglia, V., Bejder, L., Tyack, P.L., 2021. '*Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioral Responses to Human Noise'*. Aquatic Mammals, 47(5), pp.421-464.

Speakman, C.N., Hoskins, A.J., Hindell, M.A., Costa, D.P., Hartog, J.R., Hobday, A.J., Arnould, J.P.Y., 2020. '*Environmental influences on foraging effort, success and efficiency in female Australian fur seals'*. Scientific Reports, 10: 17710.

Spotila, J.R., Dunham, A.E., Leslie, A.J., Steyermark, A.C., Plotkin, P.T., Paladino, F.V., 1996. '*Worldwide population decline of Dermochelys coriacea: are leatherback turtles going extinct?*'. Chelonian Conservation Biology, 2:209-222.

Spotila,J.R., 2004. '*Sea turtles: a complete guide to their biology, behaviour, and conservation'*. Baltimore, Maryland: The John Hopkins University Press and Oakwood Arts.

Sprogis, K., Videsen, S., Madsen, P., 2020. '*Vessel noise levels drive behavioural responses of humpback whales with implications for whale-watching'*. eLife 2020;9:e56760. DOI: https://doi.org/10.7554/eLife.56760.

Stamation, K., Watson, M., Moloney, P., Charlton, C., Bannister, J., 2020. '*Population estimate and rate of increase of southern right whales Eubalaena australis in southeastern Australia'*. Endangered Species Research, 41, 373–383.

Stamation, K.A., Croft, D.B., Shaughnessy, P.D., Waples, K.A., 2007. '*Observations of humpback whales (Megaptera novaeangliae) feeding during their southward migration along the coast of southeastern New South Wales, Australia: Identification of a possible supplemental feeding ground'*. Aquatic Mammals, 33(2): 165 – 174.

State Wide Integrated Flora and Fauna Teams (SWIFT), 2021a. '*Leatherback turtle'*. Available at: http://www.swift.net.au/cb_pages/sp_leatherback_turtle.php.

State Wide Integrated Flora and Fauna Teams (SWIFT), 2021b. Southern right whale research and monitoring project. Availbe at: http://www.swifft.net.au/cb_pages/team_southern_right_whale_south_eastern_australia_monitoring.php.

State Wide Integrated Flora and Fauna Teams (SWIFT), 2021c. Humpback whale. Available at: https://www.swifft.net.au/map.php#

State Wide Integrated Flora and Fauna Teams (SWIFT), 2023. Southern right whale research and monitoring project. Available at: https://www.swifft.net.au/cb_pages/team_southern_right_whale_south_eastern_australia_monitoring.php

Steffe, A., Murphy, J., 1992. '*Offshore prawn catches in the Newcastle region, May to November 1991'*. Fisheries Research Institute, NSW, Cronulla, NSW.

Stimpert, A.K., DeRuiter, S.L., Southall, B.L., Moretti, D.J., Falcone, E.A., Goldbogen, J.A., Friedlaender, A., Schorr, G.S., Calambokidis, J., 2014. '*Acoustic and foraging behaviour of a Baird's beaked whale, Berardius bairdii, exposed to simulated sonar'*. Scientific Reports 4: 7031. DOI: 10.1038/srep07031.

Stockin, K.A., Burgess, E.A., 2005. '*Opportunistic feeding of an adult humpback whale (Megaptera novaeangliae) migrating along the coast of southeastern Queensland, Australia'*. Aquatic Mammals, 31(1): 120 – 123

Stone, C.J., 2003. '*The effects if seismic activity on marine mammals in UK waters, 1998-2000'*. Rep. No. 323. Joint Nature Conservation Committee, Aberdeen.

Stone, C.J., Tasker, M.L., 2006. '*The effects of seismic airguns on cetaceans in UK waters'*. J. Cetacean. Res. Manage., 8(3):255-263.

Streever, B., Raborn, S.W., Kim, K.H., Hawkins, A.D., Popper, A.N., 2016. '*Changes in fish catch rates in the presence of air gun sounds in Prudhoe Bay, Alaska*'. Arctic, 69(4): 346 – 358.

Streftaris, N., Zenetos, A., Papathanassiou, E., 2005. '*Globalisation in marine ecosystems: the story of non-indigenous marine species across European seas*'. Oceanogr. Marine Biol.' 43:419–453.

Sturman, A., 1996. '*The weather and climate of Australia and New Zealand*'. Oxford University Press, Melbourne, Australia.

Surfing Atlas, 2023. '*Limestone Coast*'. http://www.surfingatlas.com/division/26

Syms, C., Jones, G.P., 2000. '*Disturbance, habitat structure, and the dynamics of a coral-reef fish community*'. Ecology 81(10): 2714-2729.

Tang, K.W., Gladyshev, M.I., Dubovskaya, O.P., Kirillin, G., Grossart, H-P., 2014. '*Zooplankton carcasses and non-predatory mortality in freshwater and inland sea environments*'. Journal of Plankton Research 36: 597–612.

Thiele, L., 1983. '*Underwater noise from the propellers of a triple screw container ship*'. Rep. 82.54 from Ødegaard & Danneskiold-Samsoe K/S for Greenl. Fisheries Investig., Copenhagen, Denmark.

Thode, A., Blackwell, S., Conrad, A., Kim, K., Marques, T., Thomas, L., Oedekoven, C., Harris, D., Broker, K. 2020. '*Roaring and repetition: how bowhead whales adjust their call density and source level (Lombard effect) in the presence of natural and seismic airgun survey noise*'. The Journal of the Acoustical Society of America 147, 2061; doi: 10.1121/10.0000935.

Thompson, P.M., Brookes, K.L., Graham, I.M., Barton, T.R., Needham, K., Bradbury, G., Merchant, N.D., 2013. '*Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises*'. Proceedings of the Royal Society B, 280:20132001.

Thomsen, F., Franck, D., Ford, J.K.B., 2001. '*Characteristics of whistles from the acoustic repertoire of resident killer whales (Orcinus orca) off Vancouver Island, British Columbia*'. Journal of the Acoustical Society of America, 109(3): 1240 – 1246.

Thomson, R., Sporcic, M., Foster, S., Haddon, M., Potter, A., Carroll, A., Przeslawski, R., Knuckey, I., Koopman, M., Hartog, J., 2014. '*Examining Fisheries Catches and Catch Rates for Potential Effects of Bass Strait Seismic Surveys*'. CSIRO and Geoscience Australia, Hobart and Canberra, 84.

Threatened Species Scientific Committee (TSSC), 2009b. '*Commonwealth Listing Advice on Galeorhinus galeus*'. Department of the Environment, Water, Heritage and the Arts. In effect under the EPBC Act from 22-Jan-2009.

Threatened Species Scientific Committee (TSSC), 2012a. '*Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities*'. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/107-conservation-advice.pdf.

Threatened Species Scientific Committee (TSSC), 2013a. '*Subtropical and Temperate Coastal Saltmarsh Conservation Advice, Australian Government, Canberra*'. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/118-conservation-advice.pdf.

Threatened Species Scientific Committee (TSSC), 2018. '*Approved Conservaton Advice (including listing advice) for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community*'. Canberra: Department of the Environment and Energy

Thums, M., Ferreira, L., Jenner, C., Jenner, M., Harris, D., Davenport, A., Andrews-Goff, V., Double, M., Möller, L., Attard, CRM., Bilgmann, K., Thomson, P., McCauley, R., 2021. '*Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean*'. Global Ecology and Conservation, doi:https://doi.org/10.1016/j.gecco.2022.e02054.

Thums, M., Waayers, D., Huang, Z., Pattiaratchi, C., Bernus, J., Meekan, M., 2017. '*Environmental predictors of foraging and transit behaviour in flatback turtles Natator depressus*'. Endangered Species Research., 32: 333-349.

Tomczak, M., 1987. '*The Bass Strait water cascade during summer 1981 – 1982*'. Continental Shelf Research, 7(6): 561 – 572.

Tormosov, D.D., Mikhalev, Y.A., Best, P.B., Zemsky, V.A., Sekiguchi, K.,Brownell, R.L., Jr., 1998. '*Soviet catches of southern right whales, Eubalaena australis, 1951-1971: Biological data and conservation implications*'. Biology Conservation, 86(2), 185–197.

Tracey, S., Lyle, J., Ewing, G., Hartman, K., Mapleston, A., 2013. '*Offshore recreational fishing in Tasmania, 2011/12*'. Hobart, Tasmania, 94p.

Tracey, S.R., Lyle, J.M., Stark, K., Gray, S., Moore, A., Twiname, S., Wotherspoon, S., 2020b. '*National survey of recreational fishing for Southern Bluefin Tuna in Australia 2018/19*'. University of Tasmania – Institute for Marine and Antarctic Studies, Hobart.

Tracey, S.R., Lyle, J.M., Stark, K., Twiname, S., 2020a. '*Offshore recreational fishing in Tasmania 2018/19*'. 53p.

Travel Victoria, 2023. '*Coastal and Marine Parks*'. https://www.travelvictoria.com.au/experiences/naturewildlife/coastalmarineparks/.

Troisi, G., Borjesson, L., Bexton, S., Robinson, I., 2007. '*Biomarkers of polycyclic aromatic hydrocarbon (PAH)-associated haemolytic anemia in oiled wildlife*'. Environmental Research, 105(3): 324 – 329.

Tuna Australia, 2023. '*TGS Otway Basin 3D Marine Seismic Survey revised EP consultation*'. Provided to TGS from Tuna Australia dated 29 March 2023. Available in full consultation correspondence of this EP.

United States National Marine Fisheries Service (NMFS), 2018. '*2018 revision to technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): underwater thresholds for onset of permanent and temporary threshold shifts*'. NOAA Technical Memorandum NMFS-OPR-59. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Maryland, USA.

Vabø, R., Olsen, K., Huse, I., 2002. '*The effect of vessel avoidance of wintering Norwegian spring spawning herring*'. Fisheries research, 58(1):59-77.

Valenzuela, L.O., Sironi, M., Rowntree, V.J., Seger, J., 2009. '*Isotopic and genetic evidence for culturally inherited sites fidelity to feeding grounds in southern right whales (Eubalaena australis)*'. Molecular Ecology, 18: 782 – 791.

van der Knaap, I., Reubens, J., Thomas, L., Ainslie, M., Winter, H.V., Hubert, J., Martin, B., Slabbekoorn, H., 2020. '*Deterrence and disruption of free-ranging atlantic cod during and after a full-scale seismic survey experiment*'. Available at SSRN 3741225.

van der Knaap, I., Reubens, J., Thomas, L., Ainslie, M.A., Winter, H.V., Hubert, J., Martin, B., Slabbekoorn, H., 2021. '*Effects of a seismic survey on movement of free-ranging Atlantic cod*'. Current Biology, 31(7), pp.1555-1562.

van Ginkel, C., Becker, D., Gowans, S., Simard, P., 2017. '*Whistling in a noisy ocean: bottlenose dolphins adjust whistle frequencies in response to real-time ambient noise levels*'. Bioacoustics 2017. https://doi.org/10.1080/09524622.2017.1359670.

Van Ruth, P.D., Ward, T.M., 2009. '*Meso-Zooplankton Abundance, Distribution and Community Composition in the Eastern Great Australian Bight*'. Transactions of the Royal Society of South Australia, 133:2, 274-283, DOI: 10.1080/03721426.2009.10887124

Vancouver Fraser Port Authority, 2018. '*ECHO Program: Voluntary Vessel Slowdown Trial Summary Findings*'. June 2018 Report. https://www.flipsnack.com/portvancouver/echo-haro-strait-slowdown-trial-summary/full-view.html.

Velando, A., Munilla, I., 2011. '*Disturbance to a foraging seabird by sea-based tourism: Implications for reserve management in marine protected areas*'. Biological Conservation, 144: 1167 – 1174.

Vereide, E.H., Mihaljevic, M., Browman, H.I., Fields, D.M., Agersted, M.D., Titelman, J., de Jong, K., 2023. '*Effects of airgun discharges used in seismic surveys on development and mortality in nauplii of the copepod Acartia tonsa*'. Environmental Pollution, 327, p.121469.

Verfuss, U.K., Gillespie, D., Gordon, J., Marques, T.A., Miller, B., Plunkett, R., Theriault, J.A., Tollit, D.J., Zitterbart, D.P., Hubert, P., Thomas, L., 2018. '*Comparing methods suitable for monitoring marine mammals in low visibility conditions during seismic surveys*'. Marine Pollution Bulletin, 126, pp.1-18.

Victoria Department of Transport (DoT), 2021. '*Charting the course: Victorian recreational boating strategy*'. 60p.

Victorian Environmental Assessment Council (VEAC), 2019. '*Assessment of the values of Victoria's marine environment report*'. Victorian Environmental Assessment Council, Melbourne, Australia.

Victorian Fisheries Authority (VFA), 2018. *'Victorian Pipi Fishery Management Plan 2018'*. https://vfa.vic.gov.au/__data/assets/pdf_file/0009/436248/Victorian-Pipi-Fishery-Management-Plan-2018-for-website.pdf

Victorian Fisheries Authority (VFA), 2023a. *'Victorian Fisheries Authority – About us'*. https://vfa.vic.gov.au/about

Victorian Fisheries Authority (VFA), 2023b. *'Rock lobster'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/rock-lobster

Victorian Fisheries Authority (VFA), 2023c. *'Giant crab fishery overview'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/giant-crab/fishery-overview

Victorian Fisheries Authority (VFA), 2023d. *'Octopus fishery'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/octopus-eastern-zone-fishery

Victorian Fisheries Authority (VFA), 2023e. *'Abalone'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/abalone

Victorian Fisheries Authority (VFA), 2023f. *'Wrasse'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/wrasse

Victorian Fisheries Authority (VFA), 2023g. *'Scallop'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/scallop

Victorian Fisheries Authority (VFA), 2023h. *'The Scallop Dive (Port Phillip Bay) Fishery'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/port-phillip-bay-dive-scallop-fishery

Victorian Fisheries Authority (VFA), 2023i. *'Sea urchin'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/sea-urchin

Victorian Fisheries Authority (VFA), 2023x. *'Commercial Pipi Fishery'*. https://vfa.vic.gov.au/commercial-fishing/commercial-fisheries/pipi-fishery

Victorian Fisheries Authority (VFA, 2022). *'Corner Inlet Fishery Management Plan'*. https://vfa.vic.gov.au/__data/assets/pdf_file/0020/870140/Corner-Inlet-Fishery-Management-Plan_.pdf

Visit Victoria, 2023. *'Great Ocean Road – whale watching'*. https://www.visitvictoria.com/things-to-do/nature-and-wildlife/wildlife-and-zoos/whale-watching

Visit Victoria, 2023a. *'Great Ocean Road – scuba diving'*. https://www.visitvictoria.com/regions/great-ocean-road/see-and-do/outdoor-and-adventure/scuba-diving

Visit Victoria, 2023b. *'Great Ocean Road – surfing'*. https://www.visitvictoria.com/regions/great-ocean-road/see-and-do/outdoor-and-adventure/surfing-and-windsurfing

Waite, A.M., Thompson, P.A., Pesant, S., Feng, M., Beckley, L.E., Domingues, C.M., Gaughan, D., Hanson, C.E., Holl, C.M., Koslow, T., Meuleners, M., Montoya, J.P., Moore, T., Muhling, B.A., Paterson, H., Rennie, S., Strzelecki, J., Twomey, L., 2007. '*The Leeuwin Current and its effies: an introductory overview*'. Deep-Sea Research II, 54: 789 – 796.

Walker, T.A., Parmenter, C.J., 1990. *'Absence of a pelagic phase in the life cycle of the flatback turtle, Natator depressa (Garman)'*. Journal of Biogeography, 17:275-278.

Ward, I.A.K., Larcombe, P., Brinkman, R., Carter, R.M., 1999. '*Sedimentary processes and the Pandora Wreck, Great Barrier Reef, Australia'*. Journal of Field Archaeology, 26(1): 41 – 53.

Ward, T.M., McLeay, L.J., Dimmlich, W.F., Rogers, P.J., McClathchie, S., Matthews, R., Kämpf, J., van Ruth, P.D., 2006. '*Pelagic ecology of a northern boundary current system effects of upwelling on the production and distribution of sardine (Sardinops sagax), anchovy (Engraulis australis) and southern bluefin tuna (Thunnus maccoyii) in the Great Australian Bight'*. Fisheries Oceanography, 15(3): 191 – 207.

Wardle, C.S., Carter, T.J., Urquhart, G.G., Johnstone, A.D.F., Ziolkowski, A.M., Hampson, G., Mackie, D. 2001. *'Effects of seismic air guns on marine fish'*. Continental Shelf Research 21: 1005–1027.

Warneke, R.M., 1995. *'Humpback whale'*. In: Menkhorst, P.W. (ed.). Mammals of Victoria; distribution, ecology and conservation. Oxford University Press, Oxford, UK.

Warneke, R.M., Shaughnessy, P.D., 1985. '*Arctocephalus pusillus, the South African and Australian fur seal: taxonomy, evolution, biogeography, and life history*'. In 'Studies of Sea Mammals in South Latitudes', eds. Ling, L.K., Bryden, M.M., pp. 53 – 77.

Warner, G., Erbe, C., Hannay, D., 2010. '*Underwater Sound Measurements. (Chapter 3)*' In Reiser, C.M., D.W. Funk, R. Rodrigues, and D. Hannay (eds.). 'Marine Mammal Monitoring and Mitigation during Open Water Shallow Hazards and Site Clearance Surveys by Shell Offshore Inc. in the Alaskan Chukchi Sea, July-October 2009: 90-Day Report.' LGL Report P1112-1. Report by LGL Alaska Research Associates Inc. and JASCO Applied Sciences for Shell Offshore Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. 1- 54.

Warner, G.A., Dosso, S.E. and Hannay, D.E., 2017. '*Using vessel noise from a single hydrophone to estimate environmental properties*'. The Journal of the Acoustical Society of America, 142(4), pp.2710-2710.

Watkins, W.A., Daher, M.A., Fristrup, K.M., Howald, T.J. Di Sciara, G.N., 1993. '*Sperm whales tagged with transponders and tracked underwater by sonar*'. Marine mammal science, 9(1), pp.55-67.

Watson, M., Stamation, K., Charlton, C., Bannister, J., 2021. '*Calving intervals, long-range movements and site fidelity of southern right whales (Eubalaena australis) in south-eastern Australia*'. Journal of Cetacean Research Management 22: 17-28.

Weilgart, L.S., 2007. '*A brief review of known effects of noise on marine mammals*'. International Journal of Comparative Psychology, 20: 159 – 186.

Weilgart, L.S., 2013. '*A review of the impacts of seismic airgun surveys on marine life*'. Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25 -27 February 2014, London, UK. Available at http://www.cbd.int/doc/?meeting=MCBEM-2014-01.

Weilgart, L.S., Whitehead, H., 1990. '*Vocalizations of the North Atlantic pilot whale (Globicephala melas) as related to behavioural contexts*'. Behavioural Ecology and Sociobiology, 26(6): 399 – 402.

Weimerskirch, H., Corbeau, A., Pajot, A., Patrick, S.C., Collet, J., 2022. *Supplementary material from "Albatrosses develop attraction to fishing vessels during immaturity but avoid them at old age*". The Royal Society. Collection. https://doi.org/10.6084/m9.figshare.c.6349151.v1

Weinhold, R.J., Weaver, R.R., 1972. '*Seismic air guns affect on immature coho salmon*'. Contribution to the 42nd Annual. Meeting., Society of Exploration Geophysicists, Anaheim, California.

Weir, C.R., 2007. '*Observation of marine turtles in relation to seismic airgun sound off Angola*'. Marine Turtle Newsletter, 116:17-20.

Weir, C.R., 2008. '*Overt responses of humpback whales (Megaptera novaeangliae), sperm whales (Physeter macrocephalus), and Atlantic spotted dolphins (Stenella frontalis) to seismic exploration off Angola*'. Aquatic Mammals, 34(1): 71 – 83.

Welch, S.J., Muellenmeister, A.M., Connell, S.C., Weirathmueller, M.J., McPherson, C.R., 2023. '*TGS SLB Otway Basin 3-D Multi-client Marine Seismic Survey: acoustic modelling for assessing marine fauna sound exposures*'. Document 02778, Version 2.1, technical report by JASCO Applied Sciences for SLR.

Wells, F.E., McDonald, J.I., Huisman, J.M., 2009. '*Introduced Marine Species in Western Australia*'. Fisheries Occasional Publications No. 57. Department of Fisheries, Perth, Western Australia. 102 pp.

WhaleFacts, 2023. '*Pygmy Right Whale*'. https://www.whalefacts.org/pygmy-right-whale-facts/

Whitehead H, S. Brennan, S., Grover, D.,1992. '*Distribution and behaviour of male sperm whales on the Scotian Shelf, Canada'.* Canadian Journal of Zoology. 70:912-918.

Whitehead, H., 1996. '*Variation in the feeding success of sperm whales: temporal scale, spatial scale and relationship to migrations*'. Journal of Animal Ecology, 65(4): 429-438.

Whitlock, R.E., Hazen, E.L., Walli, A., Farwell, C., Bograd, S.J., Foley, D.G., Castleton, M., Block, B.A., 2015. '*Direct quantification of energy intake in an apex marine predator suggests physiology is a key driver of migrations*'. Sci. Adv., e1400270.

Whitting, S.D., 2000. '*The ecology of immature Green and Hawksbill Turtles foraging two reef systems in north-western Australia*'. Ph.D. Thesis. Darwin, Northern Territory University.

Wildlife Tours, 2023. '*Surf beaches on the Great Ocean Road*'. https://wildlifetours.com.au/surf-beaches-great-ocean-road/

Wilewska-Bien, M., Granhag, L., Andersson, K., 2016. '*The Nutrient Load From Food Waste Generated Onboard Ships in the Baltic Sea*'. Marine Pollution Bulletin, 105:359-366.

Williams A, Daley R, Green M, Barker B., Knuckey I., 2012. '*Mapping the distribution and movement of gulper sharks, and developing a non-extractive monitoring technique, to mitigate the risk to the species within a multi-sector fishery region off southern and eastern Australia*'. FRDC Final Report Project 2009/024. Fisheries Research and Development Corporation, Australia. pp 320.

Williams, A., Althaus, F., Smith, T., Daley, R., Barker, B., Fuller, M., 2012. '*Developing and applying a spatially-based seascape analysis (the "habitat proxy" method) to inform management of gulper sharks*'. Compendium of Discussion Papers, Report to the Australian Fisheries Management Authority, CSIRO, Australia, 188p.

Williams, A., Bax, N. J., Kloser, R. J., Althaus, F., Barker, B., Keith, G., 2009. '*Australia's deep-water reserve network: implications of false homogeneity for classifying abiotic surrogates of biodiversity*'. ICES Journal of Marine Science, 66(1), 214-224.

Williams, R., Wright, A., Ashe, E., Blight, L., Bruintjes, R., Canessa, R. et al. 2015. '*Impacts of anthropogenic noise on marine life: publication patterns, new discoveries, and future directions in research and management*'. Ocean and Coastal Management 115: 17-24.

Williamson, M., Fitter, A., 1996. '*The Characteristics of Successful Invaders*'. Biological Conservation, vol. 78, pp. 163-170.

Willis, J., Hobday, A.J., 2007. '*Influence of upwelling on movement of southern bluefin tuna (Thunnus maccoyii) in the Great Australian Bight*'. Mar. Freshwater Res., 58: 699 – 708.

Wilson, R.S., Poore, G.C.B., 1987. '*The Bass Strait Survey: biological sampling stations, 1979-1983*'. Occasional Papers from the Museum of Victoria 3: 1-14.

Winsor, M., Irvine, L., Mate, B. 2017. '*Analysis of the spatial distribution of satellite tagged sperm whales (Physeter macrocephalus) in close proximity to seismic surveys in the Gulf of Mexico*'. Aquatic Mammals 43(4): 439 – 446. DOI 10.1578/AM.43.4.2017.439.

Wise, C.F., Wise, J.T.F., Wise, S.S., Thompson, W.D., Wise, J.P., 2014. '*Chemical dispersants used in the Gulf of Mexico oil crisis are cytotoxic and genotoxic to sperm whale skin cells*'. Aquatic Toxicology, 152: 335 – 340.

Woinarski, J.C.Z, Burbidge, A.A., Harrison, P.L., 2014. '*The Action Plan for Australian Mammals 2012*'.

Womersley, H.B.S. 1984. '*The marine benthic flora of southern Australia*'. Part 1. D.J. Woolman, Government Pinter, South Australia.

Wood, J., B.L. Southall, and D.J. Tollit. 2012. *PG&E offshore 3-D Seismic Survey Project Environmental Impact Report–Marine Mammal Technical Draft Repor*t. SMRU Ltd. 121 p. https://www.coastal.ca.gov/energy/seismic/mm-technical-report-EIR.pdf

Woodside, 2007. '*Impacts of seismic airgun noise on fish behaviour: a coral reef case study*'.

Woodside, 2021. Scarborough 4D B1 Marine Seismic Survey Environment Plan. October 2021, Rev 0 (Under assessment by NOPSEMA). https://docs.nopsema.gov.au/A814954.

Woodside, 2022. Galactic Hybrid 2D MSS Environment Plan. March 2022, Revision 2 (Approved by NOPSEMA). https://docs.nopsema.gov.au/A833973.

Worcester, T., 2006. '*Effects of seismic energy on fish: A literature review*'. Prepared for Canadian Science Advisory Secretariat. Research Document 2006/092. http://www.dfo-mpo.gc.ca/csas/

Wright, A.J., Soto, N.A., Baldwin, A.L., Bateson, M., Beale, C.M., Clark, C., Deak, T., Edwards, E.F., Fernndez, A., Godinho, A., Hatch, L.T., Kakuschke, A., Lusseau, D., Martineau, D., Romero, M.L., Weilgart, L.S., Wintle, B.A., Notarbartolo-di Sciara, G., Martin, V. 2007. '*Do marine mammals experience stress related to anthropogenic noise?*' International Journal of Comparative Psychology 20 (2): 274–316.

Wursig, B., Spencer, L., Jefferson, T., Mullin, K., 1998. *'Behaviour of cetaceans in the northern Gulf of Mexico relative to survey ships and aircraft'.* Aquatic Mammals 24(1): 41-50.

Yang, W., Chen, C., Chuah, Y., Zhuang, C., Chen, I., Mooney, T., Stott, J., Blanchard, M., Jen, I., Chou, L. 2021. '*Anthropogenic Sound Exposure-Induced Stress in Captive Dolphins and Implications for Cetacean Health'*. Frontiers of Marine Science. 8:606736. doi: 10.3389/fmars.2021.606736.

Young, J.W., Jordan, A.R., Bobbi, C., Johannes, R.E., Haskard, K., Pullen, G., 1993. '*Seasonal and interannual variability in krill (Nyctiphanes australis) stocks and their relationship to the fishery for jack mackerel (Trachurus declivis) off eastern Tasmania, Australia'*. Marine Biology, 116: 9–18.

Zeh, J.M., Dombroski, J.R.G. & Parks, S.E. (2022. '*Preferred Shallow-Water Nursery Sites Provide Acoustic Crypsis to Southern Right Whale Mother–Calf Pairs*'. Royal Society Open Science 9, 5, 220241. doi: https://doi.org/10.1098/rsos.220241.

Zerbini, A.N., Secchi, E.R., Siciliano, S., Simoes-Lopes, P.C., 1997. '*A review of the occurrence and distribution of whales of the genus Balaenoptera along the Brazilian coast'*. Rep int Whal Comm, 47: 407 – 417.

APPENDIX A

TGS Environmental Policy and Health and Safety Policy

ENVIRONMENTAL POLICY

TGS is committed to protecting the environment in which we live and work, while also conducting our operations in an environmentally sustainable and responsible manner. TGS strives to lead the industry in minimizing the impact of our operations on the environment. TGS is dedicated to the continuous improvement of our environmental programs and standards across all our operations.

We will strive to achieve these commitments by:

- Planning operations to minimize and/or reduce environmental impacts to acceptable levels;
- Incorporating climate risk into TGS' business and operational strategy;
- Monitoring our performance against approved environmental management plans;
- Measuring and reporting direct and indirect Greenhouse Gas Emissions (GHG) generated through seismic operations and across TGS' supply chain;
- Carrying out environmental audits, inspections and site visits of TGS operations;
- Maintaining compliance with applicable laws, regulations and guidance from trade associations;
- Monitoring the environmental performance of our contractors throughout the life cycle of each project;
- Ensuring that our contractors restore all project sites to their original condition;
- Promoting the International Association of Geophysical Contractor's (IAGC) Ghost Net and Marine Debris Removal Initiative (GNI), and contractually requiring that all vessel contractors participate;
- Educating our employees and contractors in TGS' environmental stewardship and sustainability strategies;
- Identifying, developing and implementing alternative energy solutions;
- Publishing our environmental performance in the annual Corporate Social Responsibility report;
- Periodically reviewing this policy and related plans to ensure ongoing suitability and effectiveness.

Our environmental efforts will be based on the implementation of the following key global strategies:

- Conducting environmental risk assessments of our operations and assessing our impact on the environment;
- Minimization and reduction of waste generated by design and purchase;
- Adoption of reduce, re-use and recycle programs where efficiencies can be found;
- Where hazardous chemicals, materials or products are used, adopt substitution techniques aimed at reducing or eliminating the handling, use and storage of such items;
- Minimization of carbon emissions by survey design and minimization of technical and non-technical downtime;
- Guarding against accidental and operational pollution;
- Development of emergency response plans for environmental incidents;
- Implementing applicable UN Global Compact Sustainable Development Goals (SDG's), including SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption & Production), SDG 13 (Climate Action), SDG 14 (Life Below Water) and SDG 15 (Life on Land).

This policy is applicable across all of TGS' operations. We shall take steps to encourage our non-operated business partners to apply this policy or an equivalent policy. We expect our contractors, vendors, suppliers and consultants to adhere to this policy when providing services to, or acting on behalf of, TGS.

Kristian Johansen
Chief Executive Officer – TGS
November 2nd, 2021

Health & Safety Policy

"TGS is committed to providing a safe, healthy, sustainable, and secure workplace. Our belief is that all incidents are preventable. Our single greatest asset is our employees and we are committed to minimizing the risks to people (i.e. our employees, contractors, visitors, and others) who may encounter or subsequently be affected by our activities. We do this by providing training, maintaining defined procedures, emergency response planning, a program of continual improvement, monitoring and reporting health and safety performance, and by managing change. We hold all employees and contractors accountable for their own health and safety, as well as for those with whom they work. No job is so important, no task is so urgent, that we will not take the time to do it safely with quality in mind. We support, empower, and encourage employees to intervene and STOP any operation or activity that they feel may be unsafe or hazardous."

We are committed to:

1. Complying with the regulations and codes of practice for occupational health, safety, and security. These will be relevant to our clients' requirements, and the industry in which we operate.
2. Providing resources (e.g., worksites, machinery, tools, equipment, and people) that are safe, secure, and reduce risks to as low as reasonably practical levels.
3. Assessing the risks associated with activities or conditions that may harm people's health and safety, and implement the appropriate control measures.
4. Implementing safe systems of work that minimize the risks from our operations.
5. Delegating health and safety duties and resources, throughout the organization, allowing all staff to be held accountable for effective performance.
6. Supporting employees who STOP an activity when they believe it may compromise TGS' health or safety standards.
7. Consulting and communicating with employees, contractors, and visitors. We encourage participation in all matters relating to their health, safety, and security, and we recognize and positively reinforce safe behaviours and practices.
8. Informing stakeholders of their individual responsibilities and expect reasonable precautions to be taken to ensure their own health, safety, and security; as well as that of others, who may be affected by their acts or omissions.
9. Providing all employees with appropriate information, instruction, training, and supervision to achieve the level of competence necessary to perform their work safely.
10. Insisting that critical suppliers and contractors maintain similar health, safety, and security policies, and applicable management programs.
11. Top management's leadership and involvement in health and safety matters.

This policy provides a framework for setting occupational health, safety, and security objectives. It shall be reviewed on a regular basis to ensure ongoing suitability and effectiveness.

Kristian Johansen
Chief Executive Officer

May 19th, 2023

APPENDIX B

Underwater Acoustic Modelling Report

TGS Otway Basin 3-D Multi-client Marine Seismic Survey

Acoustic and Animat Modelling for Assessing Marine Fauna Sound Exposures

JASCO Applied Sciences (Australia) Pty Ltd

18 April 2023

Submitted to:

Dan Govier
SLR
Agreement: 13 November 2021

Authors:

Sam J. Welch
Alina M. Muellenmeister
Steven C. Connell
Michelle J. Weirathmueller
Craig R. McPherson

P001637-001
Document 02778
Version 4.0

JASCO
APPLIED SCIENCES

Suggested citation:

Welch, S.J., A.M. Muellenmeister, S. C. Connell, M.J. Weirathmueller, and C.R. McPherson. 2023. TGS Otway Basin 3-D Multi-client Marine Seismic Survey: Acoustic and Animat Modelling for Assessing Marine Fauna Sound Exposures. Document 02778, Version 4.0. Technical report by JASCO Applied Sciences for SLR.

Contents

Figures

Tables

Executive Summary

JASCO Applied Sciences (JASCO) performed a numerical estimation study of underwater sound levels associated with the planned TGS Otway Basin 3-D Multi-client Marine Seismic Survey (MSS) to assist in understanding the potential acoustic impact on key regional receptors including marine mammals, fish, sea turtles, and benthic invertebrates. The modelling considered a 3480 in^3 triple seismic source towed at 7 m depth with an impulse interval (inter-pulse interval) of 12.5 m and a crossline array separation of 75 m.

JASCO's specialised airgun array source model was used to predict the acoustic signature of the seismic source, and complementary underwater acoustic propagation models were used in conjunction with the modelled array signature to estimate sound levels over large areas around the source. Single-impulse sound fields were predicted at sixteen sites within three Assessment Areas, all within the larger Operational Area, with five additional standalone sites and two seafloor only sites, with water depths ranging for 114 to 4252 m. Accumulated sound exposure fields were predicted for a representative scenario within each of the three Areas, for likely survey operations over 24 hours. Since the original modelling was undertaken, the Operational Area has been reduced with one of the Assessment Areas now outside the Operational Area, however, those modelling results are still valid for sites with similar seismic source configuration and environmental properties including the bathymetry, sound speed profile and the geological makeup of the seabed.

The modelling methodology considered source directivity and range-dependent environmental properties likely to be encountered within the survey area. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p); zero-to-peak pressure levels (PK, L_{pk}); peak-to-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$); and either single-impulse (i.e., per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria. For each of the three Assessment Areas a separate conservative sound speed profile which would be most supportive of sound propagation conditions over for survey activities within that Area was defined and applied to all modelling, along with distinct geoacoustic profiles based on sediment and sub-bottom properties in each location.

SEL_{24h} is a cumulative metric that reflects the dosimetric effect of noise levels within 24 hours, based on the assumption that a receiver (e.g., an animal) is consistently exposed to such noise levels at a fixed position. More realistically, marine animals would not stay in the same location for 24 hours (especially in the absence of location-specific habitat) but rather a shorter period, depending on the animal's behaviour and the source's proximity and movements. Therefore, a reported radius for the SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS)) if it remained at that location for 24 hours.

A more realistic representation of the potential exposures for foraging pygmy blue whales in the foraging Biologically Important Area (BIA) and migrating southern right whales within the known core range area was undertaken using animal movement modelling ('animat modelling'). Simulations with animats restricted to these areas provide an understanding of how animats will be exposed given the location and environment-specific context in which they are most likely to occur. Scenarios in which the pygmy blue whales are seeded in an unrestricted manner allow for the calculation of exposure range across the entire survey area. These ranges may then be interpreted to determine buffer zones around the BIA for different survey options and scenarios. The unrestricted seeding approach is informative in cases where there is very little overlap between BIAs and the Active Source Area, as is the case for the foraging pygmy blue whale BIA in this survey. While acoustic modelling inherently assumes static animals, the JASCO Animal Simulation Model Including Noise Exposure (JASMINE) combines modelled sound fields with realistic animal movements to predict how animals might be impacted through sound exposure. JASMINE provides a framework for understanding and predicting

sound exposure for species of interest and for calculating ranges to relevant regulatory thresholds. The distribution of distances to the source of simulated animals ('animats') predicted to be exposed to sound levels above relevant thresholds was used to calculate the 95th percentile exposure range ($ER_{95\%}$), and the probability of animats being exposed above threshold within the $ER_{95\%}$ (P_{exp}).

A total of four scenarios were considered using animal movement modelling including one unrestricted and one restricted animat seeding scenario for pygmy blue whales and two restricted animat seeding scenarios for southern right whales.

The analysis considered the distances away from the seismic source at which several effects criteria or relevant sound levels were reached. The results are summarised below for the representative single-impulse sites and accumulated SEL scenarios for both acoustic modelling results and animat $ER_{95\%}$ results and probabilities.

Marine mammal injury and behaviour

- The maximum distance where the NOAA (2019) marine mammal behavioural response criterion of 160 dB re 1 µPa (SPL) for impulsive noise could be exceeded was between 7.39–12.2 km in Area 1, 4.45–6.61 km for Area 2, and 7.23-9.33 km in Area 3.
- The results for marine mammal injury considered the criteria from Southall et al. (2019). These criteria contain two metrics (PK and SEL_{24h}), both required for the assessment of marine mammal Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS). The longest distance associated with either metric is required to be applied for assessment. Table 1 summarises the maximum distances for PTS, along with the relevant metric associated with the maximum PTS distance.
- The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. The corresponding SEL_{24h} radii for low-frequency cetaceans were larger than those for peak pressure criteria, but they represent an unlikely worst-case scenario. More realistically, marine mammals (and fish) would not stay in the same location for 24 hours. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be injured, but rather that an animal could be exposed to the sound level associated with injury (either PTS or TTS) if it remained in that location for 24 hours.
- The distance to PTS and TTS was always farthest in the broadside direction with distances shown in Table 1.

Table 1. Summary of maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for marine mammals. Maximum extents are in the broadside direction.

Hearing group	Modelled distance to effect threshold (R_{max})		
	Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
LF cetaceans	12.2	156	0.50
HF cetaceans		0.10	-
VHF cetaceans		0.85	0.11
Otariid Seals		0.10	-

Noise exposure criteria: [1] NOAA (2019) and [2] Southall et al. (2019)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m)

Animal Movement Modelling

- The exposure ranges predicted using animat modelling are significantly more realistic, due to the incorporation of species-specific realistic movements, rather than conservative approach of calculating ranges using the maximum-over-depth sound fields and receivers which are stationary for 24 hours. This is because the exposure ranges account for animats sampling the sound field vertically and horizontally based on species-specific diving and movement parameters.
- Both scenarios with pygmy blue whales resulted in exposures. Of these, the maximum $ER_{95\%}$ to the marine mammal behavioural response threshold (NOAA 2019) was 7.01 km for the unweighted SPL results, with a probability of exposure of 41%. The maximum $ER_{95\%}$ to TTS and PTS thresholds (Southall et al. 2019) were 31.7 km and 0.13 km, respectively, with probabilities of exposure of 46% and 53%.
- Both scenarios with southern right whales resulted in exposures. Of these, the maximum $ER_{95\%}$ to the marine mammal behavioural response threshold (NOAA 2019) was 6.10 km for the unweighted SPL results, with a probability of exposure of 73%. The maximum $ER_{95\%}$ to TTS and PTS thresholds (Southall et al. 2019) were 11.0 km and 0.04 km, respectively, with probabilities of exposure of 73% and 98%.
- Exposure ranges ($ER_{95\%}$) for single exposure metrics, such as the SPL behavioural response criteria, are typically comparable to the predicted acoustic ranges. Exposure ranges are generally slightly lower than the R_{max} acoustic ranges, which is the case for the unweighted SPL results.
    - Considering pygmy blue whales, the $ER_{95\%}$ distances to the behavioural response for unweighted SPL results were slightly shorter for the unrestricted case, with a maximum of 6.21 km and a probability of exposure of 80%.
    - The southern right whale scenario, where animats are restricted to the known core range area, resulted in no exposures above the behavioural response threshold.
    - Considering southern right whale mother-calf-pairs only, the maximum $ER_{95\%}$ to the 140 dB and 160 dB behavioural threshold for weighted SPL results was 31.5 and 0.59 km, respectively, with probabilities of exposure of 61% and 82%.
- Exposure ranges from animal movement modelling for PTS and TTS criteria are typically shorter than those predicted using acoustic propagation modelling because of the shorter dwell time of the moving animats. In all scenarios, for both restricted and unrestricted cases, PTS and TTS exposure ranges were substantially shorter than acoustic ranges to threshold.
    - The pygmy blue whale restricted scenario had much smaller TTS $ER_{95\%}$ than their unrestricted counterparts, with a maximum of range for TTS 15.4 km and a probability of exposure of 32%. There were no exposures above the PTS threshold.
    - The southern right whale scenario, where animats are restricted to the known core range area, resulted in no exposures above the PTS threshold. The maximum $ER_{95\%}$ to the TTS threshold was 8.51 km with a probability of exposure of 33 %.

Sea turtles

- The PK sea turtle injury criteria of 232 dB re 1 µPa for PTS and 226 dB re 1 µPa for TTS from Finneran et al. (2017) was not exceeded at a distance greater than 20 m from the acoustic centre of the source.
- The maximum distance to the SEL_{24h} metrics from the sail line was 0.11 m for PTS onset and 0.31 km for TTS onset for the 3480 in^3 seismic source (Finneran et al. 2017). As is the case with marine mammals, a reported radius for SEL_{24h} criteria does not mean that sea turtles travelling within this radius of the source will be injured, but rather that an animal could be exposed to the sound level associated with either PTS or TTS if it remained in that location for 24 hours.

- Table 2 summarises the distances to where the criterion for behavioural response of sea turtles to the 166 dB re 1 µPa (SPL) and the 175 dB re 1 µPa (SPL) threshold for behavioural disturbance (McCauley et al. 2000a) could be exceeded.

Table 2. Summary of distances to sea turtle behavioural response criteria, temporary threshold shift (TTS), and permanent threshold shift (PTS).

Hearing group	Modelled distance to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Sea turtles	4.18	1.37	0.31	0.11

Noise exposure criteria: [1] NSF (2011), [2] , and [3] Finneran et al. (2017)

Fish, fish eggs, and fish larvae

- This modelling study assessed the ranges for quantitative criteria based on Popper et al. (2014) and considered both PK (seafloor and water column) and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:
  - Fish without a swim bladder (also appropriate for sharks in the absence of other information),
  - Fish with a swim bladder that do not use it for hearing,
  - Fish that use their swim bladders for hearing,
  - Fish eggs and fish larvae.
- Table 3 summarises distances to effect criteria for fish, fish eggs, and fish larvae along with the relevant metric. Peak seafloor sound levels were assessed at nine different depths within the Operational Area (114, 220, 450, 569, 674, 870, 903, 1139, and 1216 m).

Table 3. Summary of maximum fish, fish eggs, and larvae injury and temporary threshold shift (TTS) onset distances for single impulse and 24 h sound exposure level (SEL_{24h}) modelled scenarios.

Relevant hearing group	Effect criteria	Water column		Seafloor	
		Metric associated with longest distance to criteria	R_{max} (km)	Metric associated with longest distance to criteria	R_{max} (km)
Fish: No swim bladder	Recoverable injury	SEL_{24h}	0.11	*	*
	TTS	SEL_{24h}	4.80	SEL_{24h}	4.50
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing	Recoverable injury	PK	0.14	*	*
	TTS	SEL_{24h}	4.80	SEL_{24h}	4.50
Fish eggs, and larvae	Injury	PK	0.14	*	*

An asterisk indicates that the threshold was not reached.

Benthic invertebrates, Sponges, Coral, and Plankton

Peak and peak-to-peak sound levels at the seafloor were assessed at the same nine water depths as for fish seafloor results to assist with assessing the potential effects on these receptors. The following results were determined:

- Crustaceans: The sound level of 202 dB re 1 μPa PK-PK from Payne et al. (2008), which is representative of no effects, was considered for seafloor sound levels. The sound level was reached at ranges between 358 and 512 m for the 3480 in^3 source and was not assessed in Area 2.
- Bivalves: The distance where a particle acceleration of 37.57 ms^{-2} at the seafloor could occur was determined for comparing to results presented in Day et al. (2016a) and was not reached for any of the modelled water depths.
- Sponges and coral: The PK sound level at the seafloor directly underneath the seismic source was estimated at several modelled sites and compared to the sound level of 226 dB re 1 μPa PK for sponges and corals (Heyward et al. 2018). It was not reached at any of the modelled sites.

Divers

An SPL human health assessment of 145 dB re 1 μPa (SPL; L_P) derived from was considered for people swimming and diving and the sound level was reached at ranges between 12.5 and 30.2 km for the inshore direction depending on the modelled site.

1. Introduction

JASCO Applied Sciences (JASCO) performed a numerical estimation study of underwater sound levels associated with the planned TGS Otway Basin 3-D Marine Seismic Survey (MSS) to assist in understanding the potential acoustic effect on receptors including marine mammals, fish, sea turtles, benthic invertebrates, plankton, sponges, and corals. This study considered a single seismic source array operating in three defined Assessment Areas within the larger Operational Area.

JASCO's specialised Airgun Array Source Model (AASM) was used to predict acoustic signatures and spectra for a triple 3480 in^3 seismic source array (see Section 4.2). AASM accounts for individual airgun volumes, airgun bubble interactions, and array geometry to yield accurate source predictions. Complementary underwater acoustic propagation models were used in conjunction with the array signature and spectra to estimate sound levels considering site-specific environmental influences. Single-impulse sound fields were predicted at sixteen sites within the three defined Assessment Areas, plus at seven additional standalone sites, with water depths ranging from 114 to 4252 m. Accumulated sound exposure fields were predicted for a representative scenario within each of the Areas, for likely survey operations over 24 hours (see Section 2). Since the original modelling was undertaken the Operational Area has been reduced with one of the Assessment Areas now outside the Operational Area (see Section 2). Modelling results outside of the Operational Area are still valid for sites sharing similar seismic source orientation and environmental properties including bathymetry, sound speed profile, and geoacoustic profiles (see Appendix D.3).

The modelling methodology considered source directivity and range-dependent environmental properties. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p); zero-to-peak pressure levels (PK, L_{pk}); peak-to-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$); and either single-impulse (i.e., per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria.

The first planned seismic assessment area slightly overlaps with the pygmy blue whale foraging Biologically Important Area (BIA) and the southern right whale known core range area. Therefore, the acoustic modelling results were also used in conjunction with animal movement modelling ('animat modelling') simulations to predict the distance at which foraging pygmy blue whales (*Balaenoptera musculus brevicauda*) and migrating southern right whales (*Eubalaena australis*) are expected to be exposed above threshold criteria for PTS, TTS, and behavioural response. Sound exposure distribution estimates are determined by moving large numbers of simulated animals (animats) through a modelled time-evolving sound field, computed using specialised sound source and sound propagation models. This approach provides the most realistic prediction of the maximum expected SPL and SEL_{24h} for comparison against the relevant thresholds.

Section 3 explains the metrics used to represent underwater acoustic fields and the effect criteria considered. Section 4 details the methodology for predicting the source levels and modelling the sound propagation, including the specifications of the seismic source and all environmental parameters the propagation models require. Section 4 also describes the methodology used in the animal movement and exposure modelling simulations. Section 5 presents the results, which are then discussed and summarised in Section 6.

2. Modelling Scenarios

The Operational Area was broken up into three Assessment Areas with a nominal acquisition scenario defined for each, considering a triple 3480 in^3 seismic source, to assess the accumulated SEL. Sixteen single impulse sites were defined between the three Assessment areas, as well as seven standalone sites, including two representative sites along a 2D tie-line close to Area 2. The locations of the modelled sites are provided in Table 5, with an overview of the broad Operational Area shown in Figure 1, and a more detailed look at the lines and sites for each Assessment Area shown in Figures 2 to 4. The modelling assumed that a survey vessel sailed along survey lines at ~4.5 knots, with an impulse interval (inter-pulse interval) of 12.5 m.

The single impulse sites and accumulated SEL scenario were determined based on a proposed survey line plan. Table 4 shows the key parameters for each scenario, the acquisition period for each scenario excludes turn duration and will henceforth be referred to as 24 h. The locations were selected based on the survey line plans along with their proximity to key features and were inclusive of depths that support the greatest sound propagation towards Biologically Important Areas (BIA) near the Operational Area including southern right whale aggregation and migration, pygmy blue whale foraging and Australian sea lion foraging. The single impulse sites and accumulated SEL scenarios are considered representative of the range of water depths for locations within the Operational Area where the source will be active and the potential sound propagation characteristics that may arise during survey acquisition. Seafloor sound levels were assessed at nine different representative depths within the Operational Area ranging from a water depth of 114 to 1216 m (see Table 5). Only seafloor sound levels were assessed at the two sites along the 2D tie-line, and the depths were chosen to be representative of relevant densities and distributions for seafloor invertebrates.

Additional SPL receiver locations were chosen at key BIAs to assess possible impacts to marine fauna; the coordinates to these receivers are shown in Table 6 for cetaceans and Australian sea lions.

Since the original modelling was undertaken the Operational Area has been reduced with Assessment Area 3 now outside the Operational Area (see Figure 1). Modelling results for Area 3 are still valid for locations based on similar seismic source orientation (see Table 4), bathymetry, sound speed profile, and the geoacoustic profile (see Appendix D.3).

Table 4. Key parameters of the two accumulated sound exposure level (SEL) scenarios.

Scenario	Array	Impulse interval (m)	Tow direction (°)	Total impulses	Acquisition period (h)
1	Triple 3480 in^3 seismic source	12.5	132/312	12781	19.17
2			114/294	13529	20.29
3			125/305	14166	21.25

Table 5. Location details for the single impulse modelled sites.

Area	Site	Latitude	Longitude	MGA[1] Zone 54		Water depth (m)	Tow direction (°)
				X (m)	Y (m)		
1	1[2]	38.90809041° S	142.05632515° E	591588	5692892	870	312
	2[2]	38.95534875° S	142.12092601° E	597125	5687581	1139	312
	3	39.04581848° S	142.24497878° E	607737	5677401	1317	312
	4[2]	39.21144194° S	142.47340260° E	627207	5658725	1216	312
	5	39.06308988° S	142.11642394° E	596588	5675629	1576	132
	6	39.19402224° S	142.29639397° E	611952	5660892	1410	132
	7	39.32130343° S	142.47237502° E	626920	5646534	1437	132
2	1	39.33748148° S	142.08346765° E	593373	5645212	1723	294
	2	39.17139442° S	141.59809401° E	551665	5664033	2400	294
	3	39.32160369° S	141.77747148° E	567017	5647246	2683	114
3	1[2]	38.25910193° S	140.36450688° E	444402	5765246	569	305
	2[2]	38.01057095° S	139.91935416° E	405134	5792461	903	305
	3	37.82843710° S	139.59688835° E	376521	5812293	998	305
	4[2]	37.55920160° S	139.12584202° E	334466	5841440	674	305
	5	37.73070605° S	139.25039881° E	345824	5822622	1015	125
	6	37.88314330° S	139.51762058° E	369641	5806115	1223	125
Standalone	1	38.42767441° S	139.65109054° E	382258	5745870	3332	305
	2	39.72134603° S	140.77913003° E	481070	5603147	4252	293
	3	40.16743356° S	141.98788335° E	584120	5553191	3728	322
	4	40.55596141° S	142.95200802° E	665269	5508703	2276	322
	5[2,4]	39.28121464° S	142.82809687° E	657675	5650423	114	232
2D Tie-Line	1[3]	39.31327816° S	142.77529488° E	653051	5646955	220	232
	2[3]	39.32570188° S	142.75481231° E	651258	5645611	450	232

1 Map Grid of Australia (MGA)
2 Seafloor receptors also modelled at these sites (VSTACK)
3 Seafloor receptors only modelled at these sites (VSTACK)
4 Also the shallowest point in the Active Source Area, associated with the 2D Tie-Line

Table 6. SPL receiver locations for marine mammal Biologically Important Areas (BIAs).

Receiver Location	Longitude	Latitude	MGA Zone 54		Water Depth (m)
			X (m)	Y (m)	
Southern right whales – BIAs					
Migration and resting on migration – Victor Harbor to Portland*	38.3839° S	141.3534° E	530864.6	5751533	33.9
Aggregation – Breeding*	38.7355° S	142.2365° E	607473.8	5711844.6	75.9
Migration and resting on migration – East of Warrnambool to Philip Island area*	38.5865° S	142.7562° E	652955.7	5727650	38.3
Pygmy blue whales - BIAs					
Known foraging – Bonney Upwelling*	37.5142° S	139.1700° E	338273.1	5846505.1	459.6
Australian sea lion BIAs					
Foraging (male)*	37.3867° S	139.2667° E	346553.0	5860824	145.5

* Multiple receiver locations for each area, closest receiver location shown.

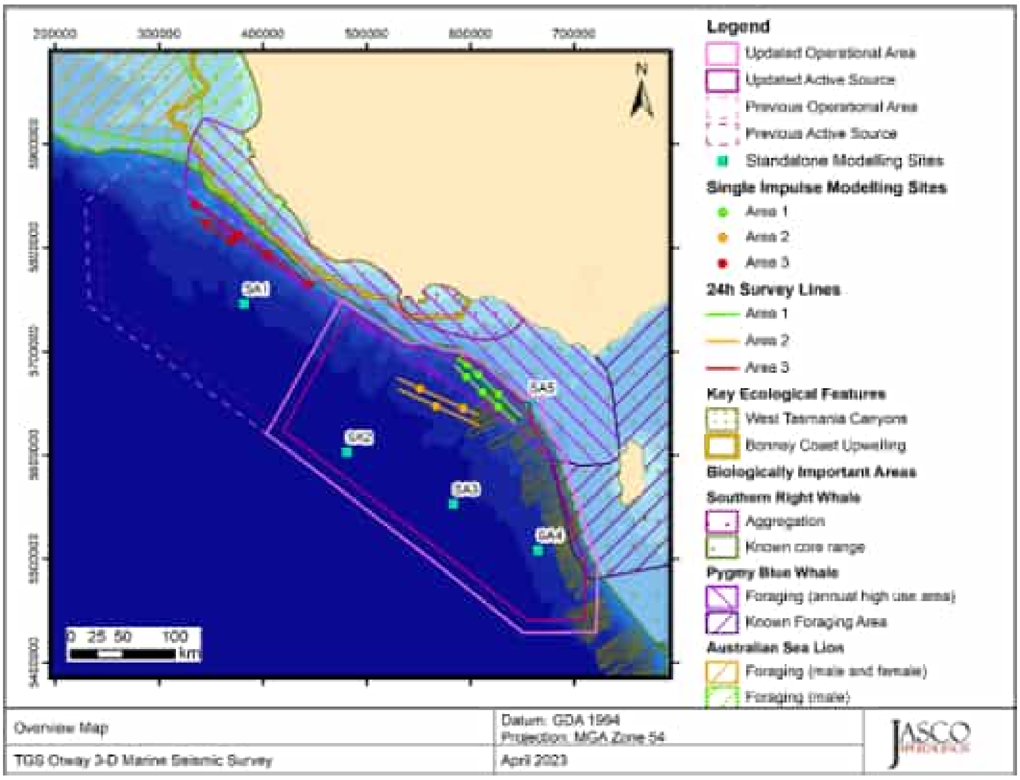


Figure 1. Overview of the modelled sites, acquisition lines, and features for the TGS Otway Basin 3-D Multi-client Marine Seismic Survey (MSS). Dotted lines show the previous Operational Area and Active Source Area while the corresponding solid lines show the updated lines with Assessment Area 3 excised. Modelling results will still be valid for locations with similar seismic source orientations and environmental properties.

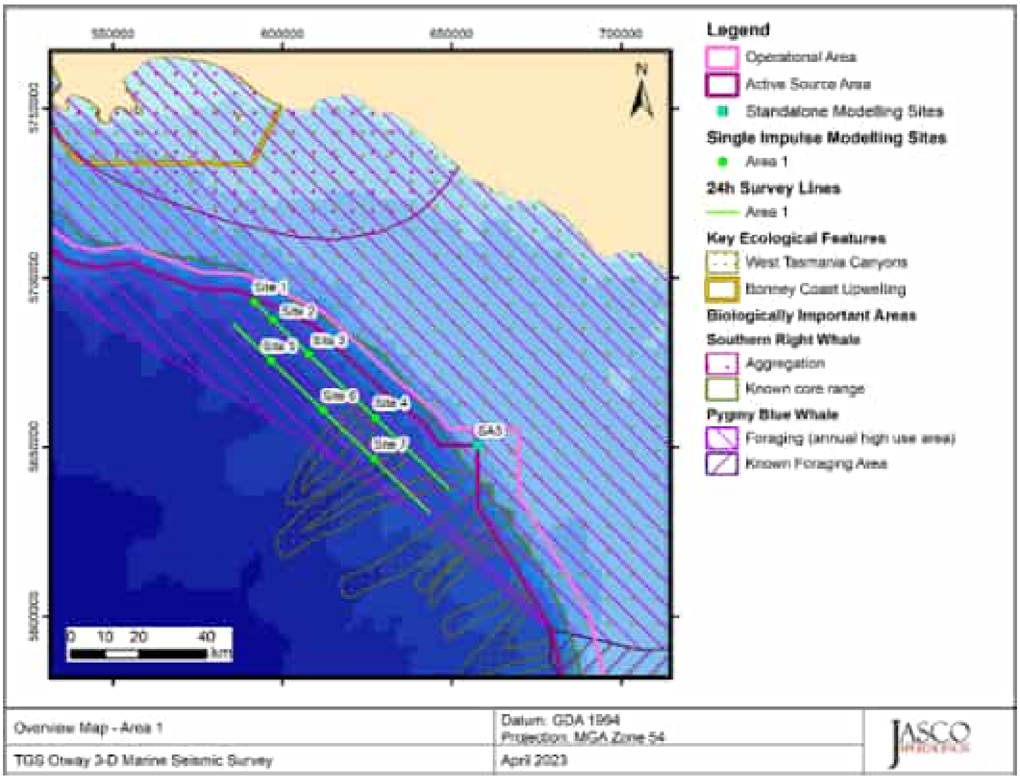


Figure 2. Area 1: Overview of the modelled sites, acquisition lines, and features for the TGS Otway Basin 3-D Multi-client Marine Seismic Survey (MSS).

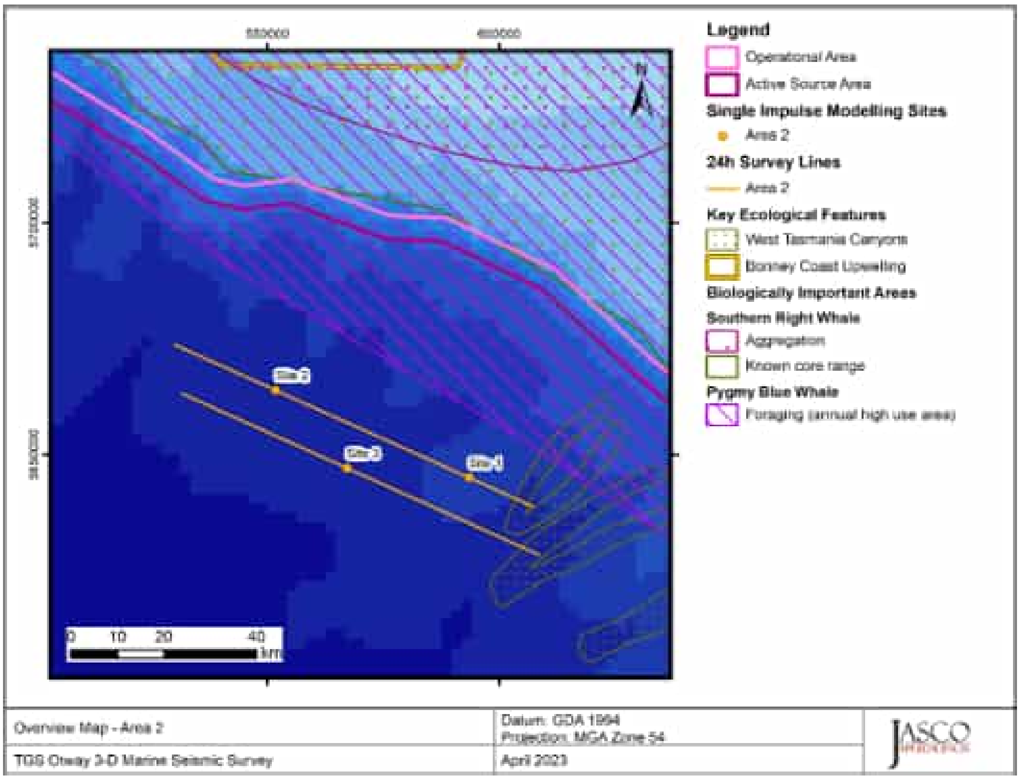


Figure 3. Area 2: Overview of the modelled sites, acquisition lines, and features for the TGS Otway Basin 3-D Multi-client Marine Seismic Survey (MSS).

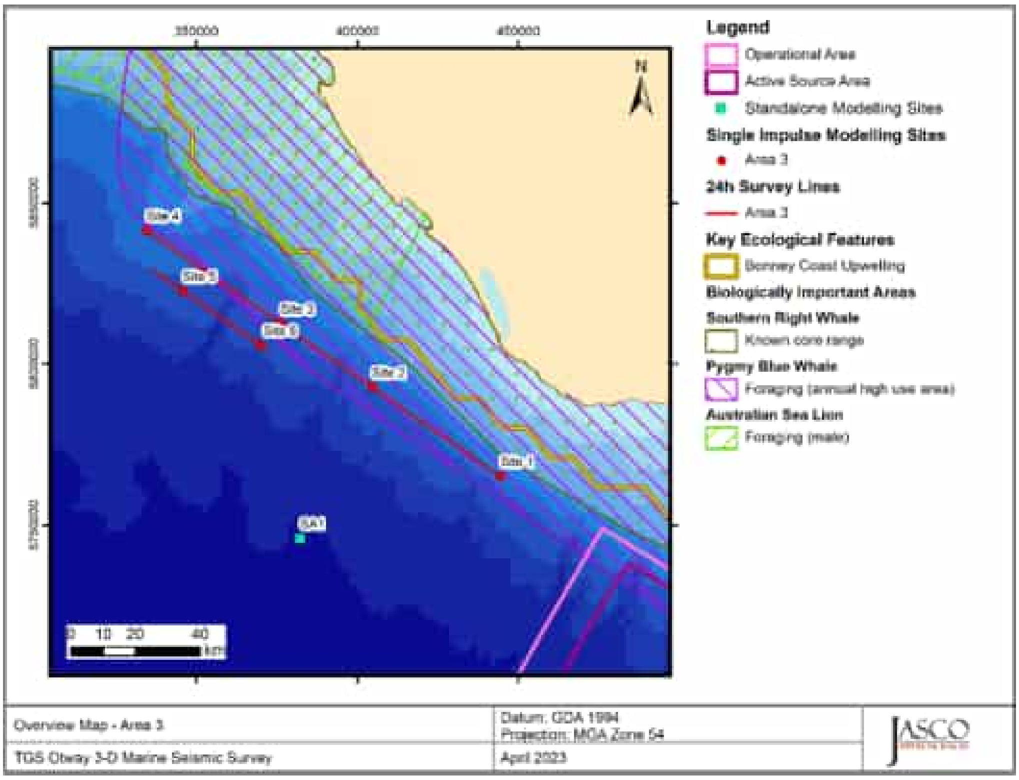


Figure 4. Area 3: Overview of the modelled sites, acquisition lines, and features for the TGS Otway Basin 3-D Multi-client Marine Seismic Survey (MSS). While the Assessment Area 3 modelling sites are not in the updated Operational Area the modelling results remain appropriate for locations with similar seismic source orientations and environmental properties.

Animal Movement modelling simulations were run for Assessment Area 1 for pygmy blue whales and southern right whales considering four scenarios, which are descripted in Table 7. In general, animats are randomly placed, or seeded, within the simulation boundary at a specified density (animats/km^2) within the species preferred depth range. During the simulation, if an animat's movement takes itself outside of its preferred depth range, it will begin to make movements (while still following the parameters within its species behaviour file) back towards its preferred depth range. For all simulations, animats were seeded at a nominal horizontal sampling density of 4 animats/km^2. Each of the animat simulations were run for a representative 24 h duration. The simulation area was selected to encompass a buffer of approximately 100 km from the centre, in any direction, with the same simulation extents being used for all four scenarios. Figure 5 shows an overview of the animat modelling simulation extents, along with the animat seeding areas for each scenario.

Table 7. JASMINE scenarios.

Scenario	Species	Description
1a	Pygmy Blue Whales, female	Unrestricted animat movements to ascertain exposure ranges to animats in all directions from the survey lines
	Pygmy Blue Whales, male	
1b	Pygmy Blue Whales, female	Restricted animat movements to the continental shelf to ascertain exposure ranges to animats on the continental shelf inboard from the survey lines
	Pygmy Blue Whales, male	
2a	Southern Right Whales, Mother & Calf	Restricted to known core range area to ascertain exposure ranges to animats on the continental shelf inboard from the survey lines
	Southern Right Whales, No Calf	
2b	Southern Right Whales, Mother & Calf	Restricted animat movements to the continental shelf to ascertain exposure ranges to animats on the continental shelf inboard from and including the survey lines
	Southern Right Whales, No Calf	

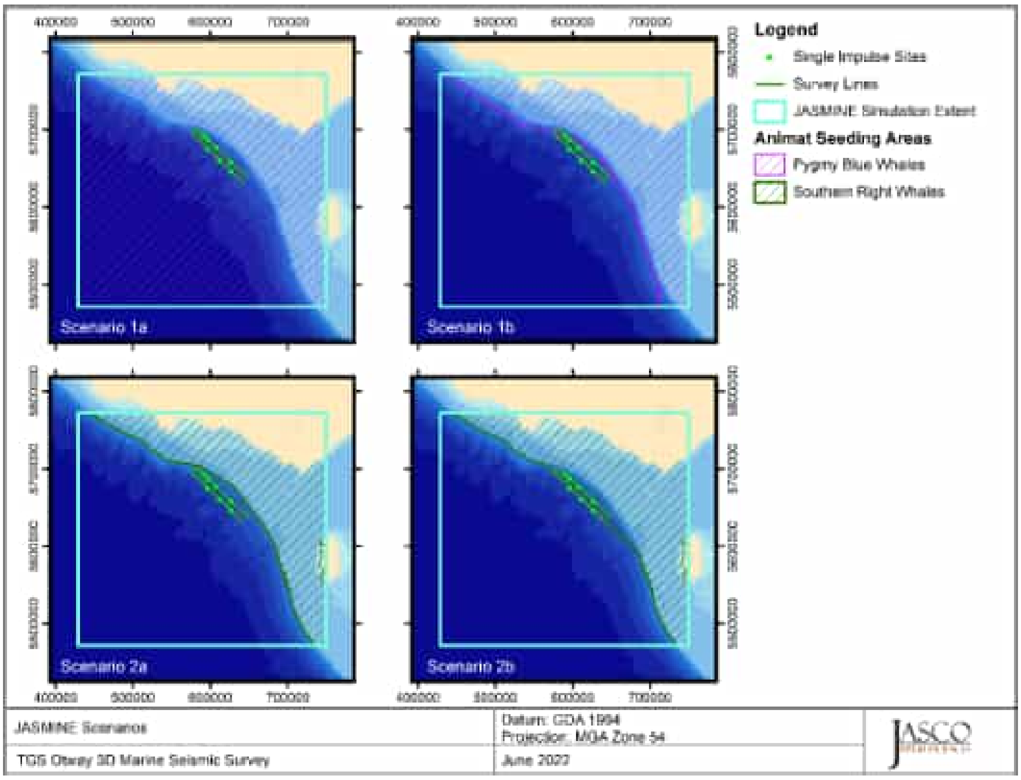


Figure 5. Overview Map of the considered scenarios (see Table 7) for animal movement modelling.

3. Noise Effect Criteria

The perceived loudness of sound, especially impulsive noise such as from seismic airguns, is not generally proportional to the instantaneous acoustic pressure. Rather, perceived loudness depends on the pulse rise-time and duration, and the frequency content. Several sound level metrics, such as PK, SPL, and SEL, are commonly used to evaluate noise and its effects on marine life (Appendix A). The period of accumulation associated with SEL is defined, with this report referencing either a "per pulse" assessment or over 24 h. Appropriate subscripts indicate any applied frequency weighting; unweighted SEL is defined as required. The acoustic metrics in this report reflect the updated ISO standard for acoustic terminology, ISO/DIS 18405:2017 (2017).

Whether acoustic exposure levels might injure or disturb marine mammals is an active research topic. Since 2007, several expert groups have developed SEL-based assessment approaches for evaluating auditory injury, with key works including Southall et al. (2007), Finneran and Jenkins (2012), Popper et al. (2014), United States National Marine Fisheries Service (NMFS 2018), and Southall et al. (2019). The number of studies that have investigated the level of behavioural disturbance to marine fauna by anthropogenic sound has also increased substantially.

The following noise criteria and sound levels for this study were chosen because they include standard thresholds, thresholds suggested by the best available science, and sound levels presented in literature for species with no suggested thresholds (Sections 3.1–3.4 and Appendix A):

1. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24\text{h}}$) from (Southall et al. 2019) for the onset of Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) in marine mammals.
2. Marine mammal behavioural threshold based on the current US National Oceanic and Atmospheric Administration (NOAA 2019) criterion for marine mammals of 160 dB re 1 µPa (SPL; L_p) for impulsive sound sources.
3. Sound exposure guidelines for fish, fish eggs and larvae (including plankton) (Popper et al. 2014).
4. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24\text{h}}$) from Finneran et al. (2017) for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) in turtles.
5. Sea turtle behavioural response threshold of 166 dB re 1 µPa (SPL; L_p) (NSF 2011), as applied by the US NMFS, along with a sound level associated with behavioural disturbance 175 dB re 1 µPa (SPL; L_p) (McCauley et al. 2000a, 2000b).
6. Peak-peak pressure levels (PK-PK; $L_{pk\text{-pk}}$) and particle acceleration (ms^{-2}) at the seafloor to help assess effects of noise on crustaceans through comparing to results in Day et al. (2016a), Day et al. (2019), Day et al. (2016b), Day et al. (2017) and Payne et al. (2008).
7. A sound level of 226 dB re 1 µPa (PK; L_{pk}) reported for comparing to Heyward et al. (2018) for sponges and corals.
8. An SPL human health assessment threshold of 145 dB re 1 µPa (SPL; L_p) for sound exposure to people swimming and diving derived from Parvin (2005), and considering Ainslie (2008).
9. An squid/octopus startle (inking) response sound level of 162 dB re 1 µPa^{2}s per-pulse SEL (L_E) (Fewtrell and McCauley 2012).

Additionally, to assess the size of the low-power zone required under the Australian Environment Protection and Biodiversity Conservation (EPBC) Act Policy Statement 2.1, Department of the Environment, Water, Heritage and the Arts (DEWHA 2008), the distance to an unweighted per-pulse SEL of 160 dB re 1 µPa^2·s (L_E) is reported.

The following subsections expand on the thresholds and sound levels for marine mammals, fish, sea turtles, fish eggs, fish larvae, and benthic invertebrates.

3.1. Marine Mammals

There are two categories of auditory threshold shifts or hearing loss: permanent threshold shift (PTS), an irreversible loss of hearing sensitivity, and Temporary Threshold Shift (TTS), a temporary reduction in an animal's hearing sensitivity as the result of receptor hair cells in the cochlea becoming fatigued.

To help assess the potential for the possible injury and hearing sensitivity changes in marine mammals, this report applies the criteria recommended by Southall et al. (2019), considering both PTS and TTS. These criteria, along with the applied behavioural criteria (NOAA 2019), are summarised in Table 8, with descriptions included in Appendix A.2.1 (auditory impairment) and Appendix A.2.2 (behavioural response), with frequency weighting explained in Appendix A.3. Of particular note, whilst the newly published Southall et al. (2021) provides recommendations and discusses nuances of assessing behavioural response, the authors do not recommend new numerical thresholds for onset of behavioural responses for marine mammals.

Table 8. Unweighted sound pressure level (SPL), 24 h sound exposure level (SEL_{24h}), and peak pressure (PK) thresholds for acoustic effects on marine mammals.

Hearing group	NOAA (2019)	Southall et al. (2019)			
	Behaviour	PTS onset thresholds[1] (received level)		TTS onset thresholds* (received level)	
	SPL (L_p; dB re 1 µPa)	Weighted SEL (L_E; dB re 1 µPa^2 s)	PK (L_{pk}; dB re 1 µPa)	Weighted SEL (L_E; dB re 1 µPa^2 s)	PK (L_{pk}; dB re 1 µPa)
Low-frequency cetaceans	160	183	219	168	213
High-frequency cetaceans		185	230	170	224
Very-high-frequency cetaceans		155	202	140	196
Otariid Seals		203	232	188	226

[1] Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
L_p-denotes sound pressure level period and has a reference value of 1 µPa.
L_{pk}, flat–peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa.
L_E - denotes cumulative sound exposure over a 24 h period and has a reference value of 1 µPa^{2}s.
Subscripts indicate the designated marine mammal auditory weighting.

To further assist in the assessment of potential behavioural responses by marine mammals, a graded probability of response for impulsive sounds using a frequency weighted SPL metric, as described in Wood et al. (2012), has been applied. Wood et al. (2012) defined behavioural response categories for sensitive species (including harbor porpoise and beaked whales), for migrating mysticetes, and all other species/behaviours. The migrating mysticete category has been applied in this analysis to southern right whales and pygmy blue whales, while all other species, including sperm whales, fall under "all other species/behaviour" category, to assess behavioural response to impulsive sounds (Table 9). The Wood et al. (2012) approach has been updated to consider the frequency weighting from Southall et al. (2019) for marine mammals as opposed to that from Southall et al. (2007).

Table 9. Behavioural response criteria used in this analysis marine mammals Probability of behavioural response frequency-weighted sound pressure level (SPL dB re 1 µPa). Probabilities are not additive. Adapted from Wood et al. (2012).

	Migrating mysticetes	All other species/behaviours
Frequency-weighted* SPL ($L_{p,LF}$; dB re 1 µPa)	Probability of response	
120	10%	
140	50%	10%
160	90%	50%
180		90%

* from Southall et al. (2019).

3.2. Fish, Fish Eggs, and Fish Larvae

In 2006, the Working Group on the Effects of Sound on Fish and Turtles was formed to continue developing noise exposure criteria for fish and turtles, work begun by a panel convened by NOAA two years earlier. The resulting guidelines included specific thresholds for different levels of effects and for different groups of species (Popper et al. 2014). These guidelines defined quantitative thresholds for three types of immediate effects:

- Mortality, including injury leading to death.
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma.
- TTS.

Masking and behavioural effects can be assessed qualitatively, by assessing relative risk rather than by specific sound level thresholds. However, as these depend upon activity-based subjective ranges, these effects are not addressed in this report and are included in Table 10 for completeness only. Because the presence or absence of a swim bladder has a role in hearing, fish's susceptibility to injury from noise exposure varies depending on the species and the presence and possible role of a swim bladder in hearing. Thus, different thresholds were proposed for fish without a swim bladder (also appropriate for sharks and applied to whale sharks in the absence of other information), fish with a swim bladder not used for hearing, and fish that use their swim bladders for hearing. Turtles, fish eggs, and fish larvae are considered separately. Table 10 lists relevant effects thresholds from Popper et al. (2014).

The SEL metric integrates noise intensity over some period of exposure. Because the period of integration for regulatory assessments is not well defined for sounds that do not have a clear start or end time, or for very long-lasting exposures, it is required to define a time. Popper et al. (2014) recommend applying a standard period, where this is either defined as a justified fixed period or the duration of the activity; however, Popper et al. (2014) also included caveats about how long the fish will be exposed because they can move (or remain in location) and so can the source. Popper et al. (2014) summarises that in all TTS studies considered, fish that showed TTS recovered to normal hearing levels within 18–24 hours. Due to this, a period of accumulation of 24 hours has been applied in this study for SEL, which is similar to that applied for marine mammals in NMFS (2016, 2018) and Southall et al. (2019).

Additional information is provided in Appendix A.2.

Table 10. Criteria for seismic noise exposure for fish, adapted from Popper et al. (2014).

Type of animal	Mortality and Potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	>219 dB SEL_{24h} or >213 dB PK	>216 dB SEL_{24h} or >213 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	210 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae (relevant to plankton)	>210 dB SEL_{24h} or >207 dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Peak sound level (PK) dB re 1 µPa; SEL_{24h} dB re 1µPa^2·s. All criteria are presented as sound pressure, even for fish without swim bladders, since no data for particle motion exist. Relative risk (high, moderate, or low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

3.3. Sea Turtles

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Popper et al. (2014) suggested thresholds for onset of mortal injury (including PTS) and mortality for sea turtles and, in absence of taxon-specific information, adopted the levels for fish that do not hear well (suggesting that this likely would be conservative for sea turtles).

Finneran et al. (2017) presented revised thresholds for sea turtle injury and hearing impairment (TTS and PTS). Their rationale is that sea turtles have best sensitivity at low frequencies and are known to have poor auditory sensitivity (Bartol and Ketten 2006, Dow Piniak et al. 2012). Accordingly, TTS and PTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al. 2014).

McCauley et al. (2000b) observed the behavioural response of caged sea turtles—green (*Chelonia mydas*) and loggerhead (*Caretta caretta*)—to an approaching seismic airgun. For received levels above 166 dB re 1 µPa (SPL), the sea turtles increased their swimming activity, and above 175 dB re 1 µPa they began to behave erratically, which was interpreted as an agitated state. The 166 dB re 1 µPa level has been used as the threshold level for a behavioural response by NMFS and applied in the Arctic Programmatic Environment Impact Statement (PEIS) (NSF 2011). In addition the 175 dB re 1 µPa level from McCauley et al. (2000b) is recommended as a criterion for behavioural disturbance. The Recovery Plan for Marine Turtles in Australia (Department of the Environment and Energy et al. 2017) acknowledges the 166 dB re 1 µPa SPL reported by McCauley et al. (2000b) as the level that may result in a behavioural response to marine turtles. These thresholds are shown in Table 11.

Table 11. Acoustic effects of impulsive noise on sea turtles: Unweighted sound pressure level (SPL), 24 hour sound exposure level (SEL_{24h}), and peak pressure (PK) thresholds

Effect type	Criterion	SPL (L_p; dB re 1 µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)
Behavioural response	NSF (2011), McCauley et al. (2000b)	166	NA	
Behavioural disturbance		175		
PTS onset thresholds[1] (received level)	Finneran et al. (2017)	NA	204	232
TTS onset thresholds[1] (received level)			189	226

[1] Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
L_p denotes sound pressure level and has a reference value of 1 µPa.
$L_{pk,flat}$ denotes peak sound pressure and is flat weighted or unweighted and has a reference value of 1 µPa.
L_E denotes cumulative sound exposure over a 24 h period and has a reference value of 1 µPa²s.

3.4. Invertebrates

3.4.1. Benthic Invertebrates (Crustaceans and Bivalves)

Research is ongoing into the relationship between sound and its effects on crustaceans, including the relevant metrics for both effect and impact. Available literature suggests particle motion, rather than sound pressure, is a more important factor for crustacean and bivalve hearing. Water depth and seismic source size are related to the particle motion levels at the seafloor, with larger arrays and shallower water being related to higher particle motion levels, more likely relevant to effects on crustaceans and bivalves.

At the seafloor interface, crustaceans and bivalves are subject to particle motion stimuli from several acoustic or acoustically induced waves. These include the particle motion associated with an impinging sound pressure wave in the water column (the incident, reflected, and transmitted portions), substrate acoustic waves, and interface waves of the Scholte type. However, it is unclear which aspect(s) of these waves is/are most relevant to the animals, either when they normally sense the environment or their physiological responses to loud sounds so there is not enough information to establish similar criteria and thresholds as done for marine mammals and fish. Including recent research, such as Day et al. (2016b), current literature does not clearly define an appropriate metric or identify relevant levels (pressure or particle motion) for an assessment. This includes the consideration of what particle motion levels lead to a behavioural response, or mortality. Therefore, at this stage, we cannot propose authoritative thresholds to inform the impact assessment. However, levels can be determined for pressure metrics presented in literature to assist the assessment.

The pressure and acceleration examples provided in Day et al. (2016a)(Figures 11 and 12) indicate that the acceleration and pressure signals occurred simultaneously, which was interpreted as an indication that the waterborne sounds were responsible for the accelerations measured by the geophones. For clarity, it is important to distinguish that the acceleration from waterborne sound energy is *not* ground roll, which Day et al. (2016a) correctly define as the sound that propagates along the interface at a speed lower than the shear wave speed of the sediment. However, the report subsequently uses ground roll for all further discussions of particle acceleration. While Day et al. (2016a) discuss that they chose the simplest measure of ground roll, it should have been referring to as ‘the acceleration from waterborne sound energy’, or ‘waterborne acceleration’ for short.

For crustaceans, a PK-PK sound level of 202 dB re 1 µPa (Payne et al. 2008) is considered to be associated with no effect, and therefore applied in the assessment. Additionally for context related to different levels of potential impairment, the PK-PK sound levels determined for crustaceans in Day et al. (2016b), 209–212 dB re 1 µPa and 213 dB re 1 µPa from Day et al. (2019), are also included.

For bivalves, PK-PK sound levels of 212, and 213 are presented to allow comparison to the maximum sound levels measured in Day et al. (2016a) and Day et al. (2017) for scallops and pearl shell oyster.

Literature does not present a sound level associated with no impact, and as particle motion is the more relevant metric, particle acceleration from the seismic source has been presented for comparing the results in Table 7 of Day et al. (2016a). The maximum particle acceleration assessed for scallops was 37.57 ms^{-2}.

3.5. Human Health Assessment Threshold

Underwater, the human ear is about 20 dB less sensitive than it is in air at low frequencies (20 Hz), increasing to 40 dB at mid–frequencies (less than 1 kHz), and increasing to 70–80 dB less sensitive at higher frequencies (Parvin 1998). Divers who wear neoprene hoods have even higher hearing thresholds (lower sensitivity) above 500 Hz because the hood material absorbs high–frequency sounds (Sims et al. 1999). Exposure studies related to divers have typically focused on military sonar exposure, with little information on seismic surveys, and as such care is required when considering thresholds for recreational divers and swimmers, particularly for impulsive sounds such as seismic surveys (Ainslie 2008).

The auditory threshold of hearing under water was lowest at 1 kHz (70 dB re 1 µPa SPL) and increased for lower and higher frequencies to around 120 dB re 1 µPa at 20 Hz and at 20 kHz (Parvin 1998). Fothergill et al. (2000) and Fothergill et al. (2001) conducted controlled acoustic exposure experiments on military divers under fully controlled conditions at a US Ocean Simulation Facility and an US Open water test facility; in all tests, the diver were covered with soft or hard shell dive suits and their position and distance relative to sound source, signal characteristics and received levels were controlled and documented (Pestorius et al. 2009). A total of 89 male Navy divers were exposed to pure tone signals and sweeps between 160–320 Hz at SPLs up to 160 dB re 1 µPa. The divers were exposed to these sounds over 100 seconds at depths from 10 to 40 metres. The divers rated the sounds on a severity scale. For frequencies between 100 and 500 Hz, at a received SPL of 130 dB re 1 µPa, divers and swimmers detected body vibration. None of the divers tested rated levels of 140 dB re 1 µPa as “very severe”; however, at 157 dB re 1 µPa, sound was rated as “very severe” 19 % of the time. No physiological damage was observed at the highest levels tested: 160 dB re 1 µPa (Fothergill et al. 2001). In a subsequent study, recreational divers were exposed to tonal signals or 30 Hz sweeps at frequencies between 100 and 500 Hz at received levels of 130–157 dB re 1 µPa (Pestorius et al. 2009). Each exposure lasted for 7 s. Nine female and 17 male scuba divers were tested, all wearing full body neoprene wetsuits. Diver aversion and perception of body vibration were used as test parameters. The results showed no sex–specific differences. The results differed as a function of frequency – while test results showed a strong overall variation between subjects, signals at 100 Hz elicited the strongest aversion in all tests and even at 148 dB a few diver ratings indicated extreme aversion. Due to this and the strong variation between test subjects, the following exposure limit for both military and recreational divers was suggested as a conservative measure: For frequencies between 100 and 500 Hz, the maximum SPL should be 145 dB re 1 µPa over a maximum continuous exposure of 100 seconds or with a maximum duty cycle of 20 % and a maximum daily cumulative total of 3 h. The trading relation between the maximum SPL and duration was 4 dB per doubling of duration (e.g., 141 dB SPL for a 200 second exposure) (Pestorius et al. 2009).

Considering only frequencies between 100 and 500 Hz, Parvin (2005) suggested 145 dB re 1 µPa as a safety criterion for recreational divers and swimmers. Seismic impulses are broadband sources, and therefore, to be precautionary, the 145 dB re 1 µPa SPL suggested by Fothergill et al. (2001) and Parvin (2005) has been applied in this study as a broadband SPL and as a human health assessment threshold for recreational divers and swimmers. This does not imply that this level is associated with the onset of injury.

4. Methods

4.1. Parameter Overview

The specifications of the seismic sources and the environmental parameters used in the propagation models are described in detail in Appendix D. Individual sound speed profiles for September were considered for each area in this modelling study; this was identified as the seasonal period that would provide the farthest propagation (Appendix D.3.2) due to the presence of a slightly upward refracting sound speed profile.

Three distinct geological zones were identified within the Operational Area – shelf, slope, and deep. The shelf is generally characterised by varying layers of sand overlaying calcarenite, the slope by silty carbonate sand to semi-cemented limestone, and the deep by increasingly compacted clayey silt. Further details of the geoacoustic parameters are presented in Appendix D.3.3.

4.2. Acoustic Source Model

The pressure signature of the individual airguns and the composite decidecade-band point-source equivalent directional levels (i.e., source levels) of the 3480 in^3 seismic source were modelled with JASCO's Airgun Array Source Model (AASM). Although AASM accounts for notional pressure signatures of each seismic source with respect to the effects of surface-reflected signals on bubble oscillations and inter-bubble interactions, the surface-reflected signal (known as surface ghost) is not included in the far-field source signatures. The acoustic propagation models account for those surface reflections, which are a property of the propagating medium rather than the source.

AASM considers the following:

- Array layout,
- Volume, tow depth, and firing pressure of each airgun, and
- Interactions between different airguns in the array.

The seismic source was modelled over AASM's full frequency range, up to 25 kHz. Appendix B.1 details this model.

4.3. Sound Propagation Models

Three sound propagation models were used to predict the acoustic field around the seismic source:

- Combined range-dependent parabolic equation and Gaussian beam acoustic ray-trace model (MONM-BELLHOP, 5 Hz to 25 kHz).
- Full Waveform Range-dependent Acoustic Model (FWRAM, 5 to 1024 Hz).
- Wavenumber integration model (VSTACK, 10 to 1024 Hz).

The models were used in combination to characterise the acoustic fields at short and long ranges in terms of SEL, SPL, PK, and PK-PK. Appendix C details each model. MONM-BELLHOP was used to calculate SEL in a 360° area around each source location. FWRAM was used to model synthetic seismic pulses and to generate a generalised range-dependent SEL-to-SPL conversion function for the modelled sites. The range-dependent conversion function was applied to predicted per-pulse SEL results from MONM-BELLHOP to estimate SPL values. FWRAM was also used to calculate water column PK and PK-PK levels.

VSTACK was used to calculate close range PK, PK-PK, and particle motion levels along four transects at the seafloor along the endfire and broadside directions of the seismic source at nine water depths: 114, 220, 450, 569, 674, 870, 903, 1139, and 1216 m.

4.4. Accumulated SEL

During a seismic survey, new sound energy is introduced into an environment with each pulse from the seismic source. While some impact criteria are based on the per-pulse energy released, others, such as the marine mammal and fish SEL criteria used in this report (Sections 3.1–3.4), account for the total acoustic energy marine fauna is subjected to over a specified duration, defined in this report as 24 h. An accurate assessment of the accumulated sound energy depends not only on the parameters of each seismic impulse but also on the number of impulses delivered in a duration and the relative positions of the impulses.

When there are many seismic pulses, it becomes computationally prohibitive to perform sound propagation modelling for every single event. The distance between the consecutive seismic impulses is small enough, however, that the environmental parameters that influence sound propagation are virtually the same for many impulse points. The acoustic fields can, therefore, be modelled for a subset of seismic pulses and estimated at several adjacent ones. After sound fields from representative impulse locations are calculated, they are adjusted to account for the source position for nearby impulses.

Although estimating the accumulated sound field with the described approach is not as precise as modelling sound propagation at every impulse location, small-scale, site-specific sound propagation features tend to blur and become less relevant when sound fields from adjacent impulses are summed. Larger scale sound propagation features, primarily dependent on water depth, dominate the cumulative field. The accuracy of the present method acceptably reflects those large-scale features, thus providing a meaningful estimate of a wide area SEL field in a computationally feasible framework.

To produce the map of accumulated received sound level distributions and calculate distances to specified sound level thresholds within each Assessment Area, the maximum-over-depth level was calculated at each sampling point within the modelled Area. The radial grids of maximum-over-depth and seafloor sound levels for each impulse were then resampled (by linear triangulation) to produce a regular Cartesian grid. The sound field grids from all impulses were summed (Equation A-5) to produce the cumulative sound field grid with cell sizes of 20 m. The contours and threshold ranges were calculated from these flat Cartesian projections of the modelled acoustic fields. The single-impulse SEL fields were computed over model grids approximately 200 × 200 km, which encompasses the full area of the cumulative grid (the entire Assessment Area).

The unweighted (fish) and frequency-weighted SEL_{24h} results were rendered as contour maps, including contours that focus on the relevant criteria-based thresholds. Only contours at ranges larger than the nearfield of the seismic source were rendered.

4.5. Geometry and Modelled Regions

To assess sound levels with MONM-BELLHOP, the sound field modelling calculated propagation losses up to distances of 100 km from the source in each cardinal direction at each single impulse site, with a horizontal separation of 20 m between receiver points along the modelled radials. The sound fields were modelled with a horizontal angular resolution of $\Delta\theta = 2.5°$ for a total of N = 144 radial planes. Receiver depths were chosen to span the entire water column over the modelled areas, from 2 m to a maximum of 5635 m, with step sizes that increased with depth. To supplement the MONM results, high-frequency results for propagation loss were modelled using BELLHOP for frequencies from 1.25 to 25 kHz. The MONM and Bellhop results were combined to produce results for the full frequency range of interest.

FWRAM was run to 100 km, but only along four radials at the selected single impulse sites (fore and aft endfire, and port and starboard broadside) for computational efficiency. This was done to compute SEL-to-SPL conversions (see Appendix D.2) but also to quantify water column PK and PK-PK. The horizontal range step is dependent on frequency and ranges from 50 m at lower frequencies to 10 m above 800 Hz.

The maximum modelled range for VSTACK for each modelled water depth was 1000 m. A variable receiver range increment that increased away from the source was used, which increased from 10 to 25 m. Received levels were computed for receivers at 5 and 50 cm above the seafloor to assist in assessing invertebrates and fish, respectively.

4.6. Animal Movement and Exposure Modelling

4.6.1. Methodology

The JASCO Animal Simulation Model Including Noise Exposure (JASMINE) was used to predict the exposure of animats to sound arising from the seismic activity. JASMINE integrates the predicted sound field with biologically meaningful movement rules for each marine mammal species (pygmy blue whales and southern right whales for the current analysis) that results in an exposure history for each animat in the model. In JASMINE, the sound received by the animats is determined by the proposed seismic operations. As illustrated in Figure 6, animats are programmed to behave like the marine animals that may be present in an area. The parameters used for forecasting realistic behaviours (e.g., diving and foraging depth, swim speed, surface times) are determined and interpreted from marine mammal studies (e.g., tagging studies) where available, or reasonably extrapolated from related or comparable species. For cumulative metrics, an individual animat’s sound exposure levels are summed over a 24 h duration to determine its total received energy, and then compared to the relevant threshold criteria. For single-exposure metrics, the maximum exposure is evaluated against threshold criteria for each 24 h period. For additional information on JASMINE, see Appendix D.4.

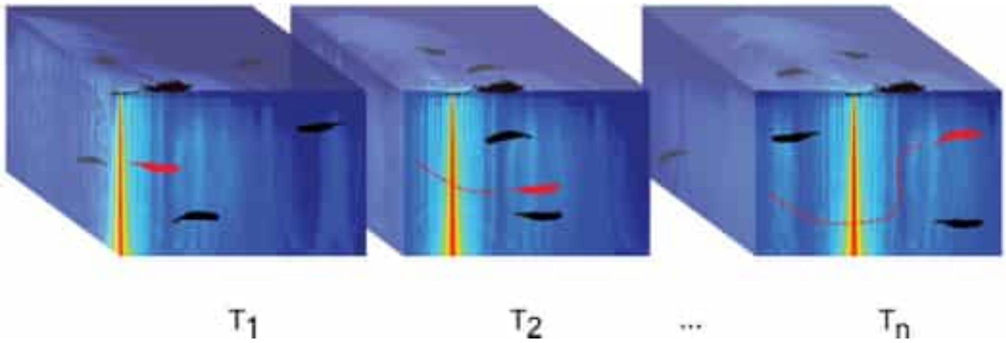


Figure 6. Depiction of animats in a moving sound field. Example animat (red) shown moving with each time step (T_n). The acoustic exposure of each animat is determined by where it is in the sound field, and its exposure history is accumulated as the simulation steps through time.

The simulation was run for a representative period of 24 h to coincide with the acoustic modelling effort. The exposure criteria for impulsive sounds (described in Section 3) were used to determine the number of animats that exceeded thresholds. To generate statistically reliable probability density functions, model simulations were run with animat sampling densities of 4 animats/km^2. The modelling results are not related to real-world density estimates for pygmy blue whales and southern right whales within the BIA or known core range area, as the number of animals potentially exposed is not calculated. The location of the acoustic source and the BIA/known core range BIA are shown in Figure 1. To evaluate PTS, TTS and behavioural response, exposure results were obtained using detailed behavioural information for pygmy blue whales and southern right whales (described in Section 4.6.3 and Section 4.6.4). Table 7 summarises the modelled scenarios. Figure 5 illustrates the differences between the corresponding seeding areas.

The seismic source was modelled as a vessel towing an airgun array at a speed of ~4.5 knots, with an impulse interval of 12.5 m. The simulated source tracks followed a racetrack configuration with acquisition not occurring on turns. At the time and location of each seismic pulse, the modelled source location with the most similar depth was selected for exposure modelling due to the variation of the bathymetry in that area. The track lines along with the acoustic modelling locations are shown in Figure 1.

Figure 7 shows an example animat track (generated for information purposes only and not related to the results presented in this report) with associated received levels from a stationary point source. The top panel displays the animat track relative to the point source, and the bottom panel displays the accumulation of SEL_{24h} for TTS and PTS criteria. At approximately 50 seconds, the animat is exposed so that the TTS threshold is exceeded, and at approximately 700 seconds the animat is exposed so that the PTS threshold is exceeded.

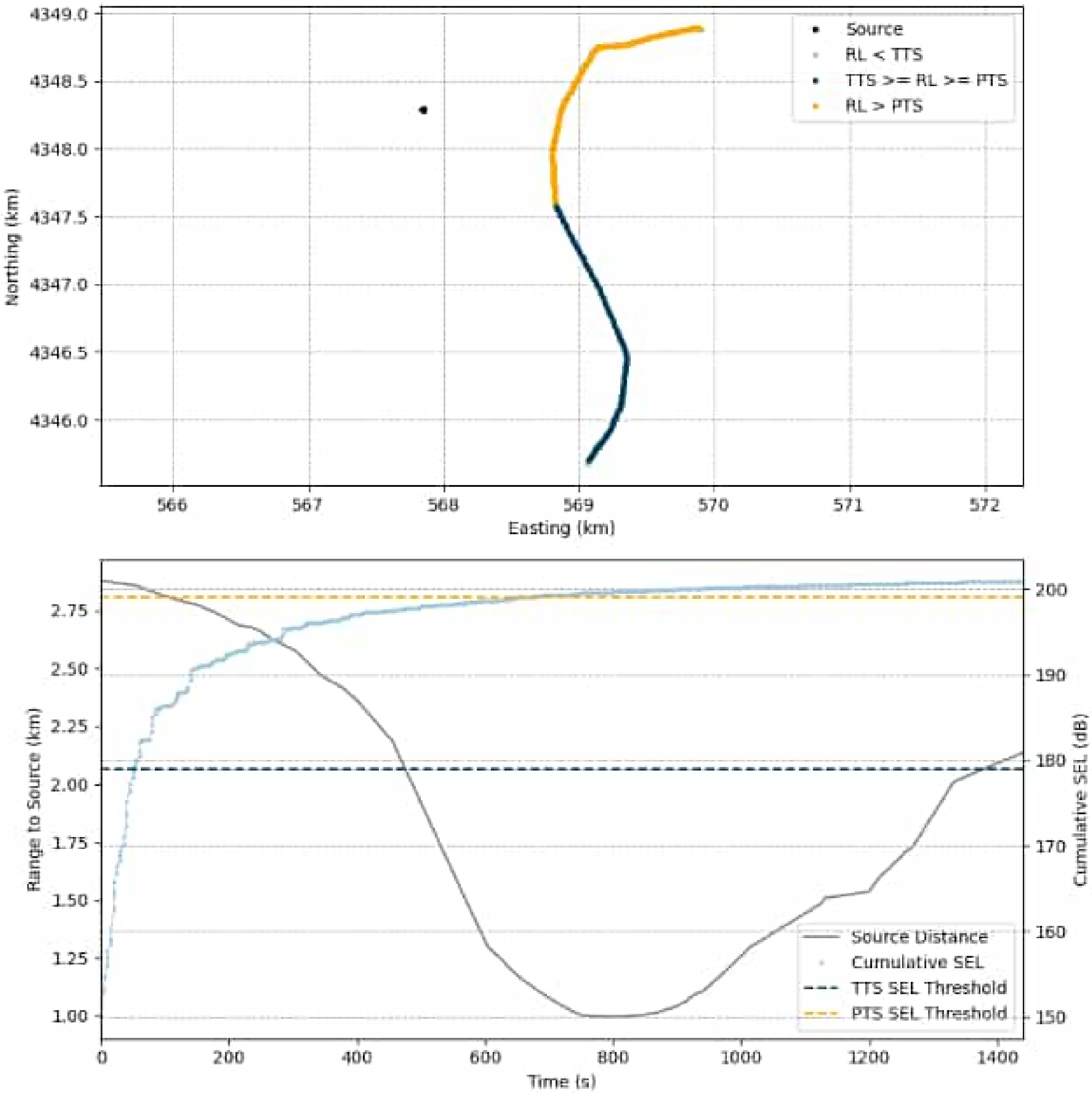


Figure 7. Animat track from an example simulation showing northward movement over a duration of 1400 seconds. The upper panel shows a plan view of both a stationary point source and a foraging animat. Animat steps are coloured to indicate whether the accumulated sound energy at that point has exceeded either TTS or PTS threshold criteria. The lower panel shows horizontal distance in kilometres to the source (grey line; left y-axis) and cumulative 24-h SEL ($L_{E,24h}$, dB re 1 µPa²·s; right y-axis) as a function of time. Note that this example does not use data from the current study.

4.6.2. Exposure–based Radial Distance Estimation

The results from the animal movement and exposure modelling provided a way to estimate radial distances to effect thresholds. The distance to the closest point of approach (CPA) for each of the animats was recorded. The $ER_{95\%}$ (95% Exposure Range) is the horizontal distance that includes 95% of the animat CPAs that exceeded a given effect threshold (see Section 3.1). Within the $ER_{95\%}$, there is generally some proportion of animats that do not exceed threshold criteria. This occurs for several reasons, including the spatial and temporal characteristics of the sound field and the way in which animats sample the sound field over time, both vertically and horizontally. The sound field varies as a function of range, depth, and azimuth based on a variety of factors such as bathymetry, sound speed profile, and geoacoustic parameters. The way the animats sample the sound field depends upon species-typical swimming and diving characteristics (e.g., swim speed, dive depth, surface intervals, and reversals). Furthermore, even within a particular species definition, these characteristics vary with behavioral state (e.g., feeding, migrating). As this results in some animats not exceeding threshold criteria even within the $ER_{95\%}$, the probability that an animat within that distance was exposed above threshold within the $ER_{95\%}$ was also computed (P_{exp}) to provide additional context.

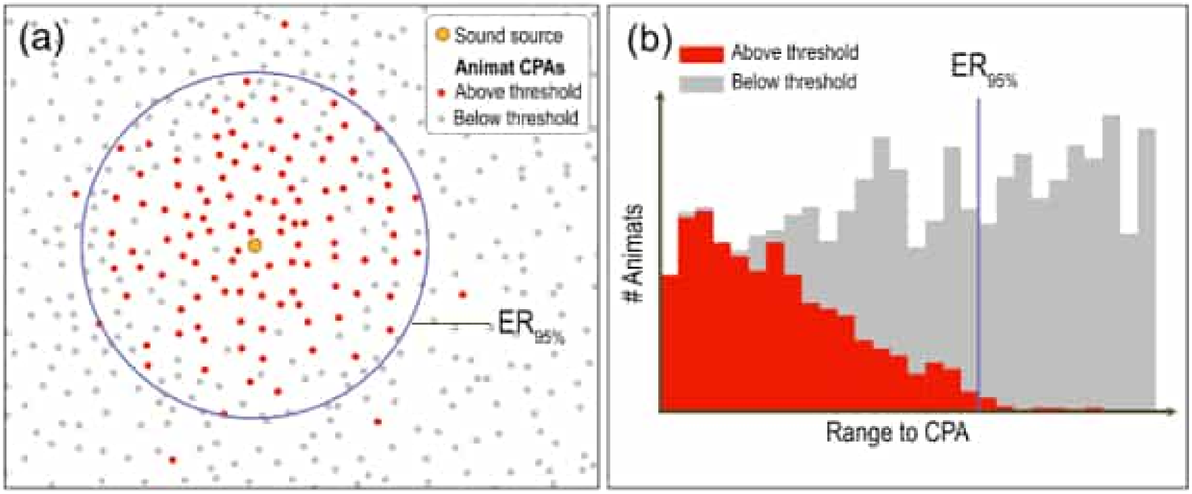


Figure 8. Example distribution of animat closest points of approach (CPAs). Panel (a) shows the horizontal distribution of animats near a sound source. Panel (b) shows the distribution of distances to animat CPAs. The 95% exposure range ($ER_{95\%}$) is indicated in both panels.

4.6.3. Pygmy Blue Whale Behaviour Profile

The project area partially overlaps with a possible foraging Biologically Important Area (BIA) for pygmy blue whales (DoE (AU) 2015-2025). Therefore, only foraging behaviours were considered in the species profile.

Data on fine-scale foraging behaviour are not currently available for pygmy blue whales. Therefore, data from multi-sensor tags deployed on blue whales from the North Pacific were used to inform the feeding behaviours. Irvine et al. (2019) used intermediate-duration archival tags (SPLASH MK10) attached to eight blue whales off the coast of California and was able to determine two feeding modes based on depth: shallow and deep. These two feeding behaviours differed further between males and females, with females generally diving deeper than males during both shallow and deep feeding. In order to account for these differences, female and male pygmy blue whales were modelled separately, with values derived from Irvine et al. (2019). The remaining parameters for feeding behaviour were primarily sourced from Goldbogen et al. (2011), who deployed 25 multi-sensor suction cup tags (DTAGs) on blue whales off the coast of California. The exception was the value for travel speed, which was derived from satellite tags deployed on pygmy blue whales off southern Australia (Möller et al. 2020).

4.6.4. Southern Right Whale Behaviour Profile

The project area is located near the known core range area for southern right whales.

September (the worst-case scenario indicated by the acoustic modelling) corresponds closest to the end of their calving/breeding season and the start of their migration (McCauley 2021). At this time, most pregnant females will likely have given birth, and sightings of mother/calf pairs have been documented in this area (Stamation et al. 2020). The behaviour of right whale mother/calf pairs can be dramatically different from other demographics, particularly in regards to the amount of time spent resting at the surface (Cusano et al. 2019, Nielsen et al. 2019). Therefore, separate behavioural profiles were modelled for mother/calf pairs and for all other demographics, with only migrating behaviours included. The behaviour of migrating southern right whales was modelled to reflect animats transiting through the known core range area on a 312º track for the northward migration. This represents the animals migrating along the west coast of Australia to their breeding grounds in Indonesia (Double et al. 2014, Thums and Ferreira 2021).

Fine-scale behavioural data on southern right whales are limited, however travel speed was derived from satellite-tagged southern right whales (Mackay et al. 2020). The remaining parameters used for the species profiles were primarily sourced from multi-sensor tags (DTAGs) deployed on North Atlantic right whales (Baumgartner and Mate 2003, Nousek McGregor 2010, Dombroski et al. 2021).

5. Results

5.1. Acoustic Source Levels and Directivity

AASM (Section 4.2) was used to predict the horizontal and vertical overpressure signatures and corresponding power spectrum levels for the seismic source, with results provided in Appendix B.3 along with the horizontal directivity plots for the selected source.

Table 12 shows the PK and per-pulse SEL source levels in the horizontal-plane broadside (perpendicular to the tow direction), endfire (along the tow direction), and vertical directions for the modelled triple 3480 in^3 seismic source. The vertical source level that accounts for the 'surface ghost' (the out of phase reflected pulse from the water surface) is also presented to make it easier to compare the output of other seismic source models.

Figure B-2 in Appendix B.3 shows the broadside, endfire, and vertical overpressure signature and corresponding power spectrum levels for the source. The signature consists of a strong primary peak, related to the initial release of high-pressure air, followed by a series of pulses associated with bubble oscillations. Most energy was produced at frequencies below 500 Hz. Frequency-dependent peaks and nulls in the spectrum result from interference among airguns in the source and correspond with the volumes and relative locations of the airguns to each other.

Table 12. Far-field source level specifications for the triple 3480 in^3 seismic source, for a 7 m tow depth. Source levels are for a point-like acoustic source with equivalent far-field acoustic output in the specified direction. Sound level metrics are per-pulse and unweighted.

Direction	Peak source pressure level ($L_{S,pk}$; dB re 1 µPa m)	Per-pulse source SEL ($L_{S,E}$; dB 1 µPa^{2}m^{2}s)	
		10–2000 Hz	2000–25000 Hz
Broadside	248.9	225.1	185.3
Endfire	247.7	224.9	190.4
Vertical	258.3	231.2	197.6
Vertical (surface affected source level)	258.3	233.8	200.6

5.2. Per-pulse Sound Fields

This section presents the per-pulse sound fields in terms of maximum-over-depth SPL, SEL, PK, and seafloor PK and PK-PK. The different metrics are presented for the following reasons:

- SPL sound fields were used to determine the distances to marine mammal and turtle behavioural thresholds (see Sections 3.1 and 3.3).
- Per-pulse SEL sound fields are used as inputs into the 24 h SEL scenario and to provide context for the range to 160 dB re 1 µPa^2·s, relevant for the EPBC Act Policy Statement 2.1 (DEWHA 2008).
- PK metrics within the water column are relevant to thresholds and guidelines for marine mammals, sea turtles, fish, fish eggs, and larvae (as well as plankton; see Sections 3.1–3.3).
- PK metrics at the seafloor are relevant to guidelines for fish, fish eggs, and larvae (see Section 3.3) and the sound level for no effect on corals and sponges.

- PK-PK metrics at the seafloor are relevant to sound levels used in assessing effects on benthic invertebrates (Section 3.4.1).

The maximum and 95% distances to per-pulse SEL and SPL metrics are presented in the following:

- Area 1 – Tables 13 and 14
- Area 2 – Tables 19 and 20
- Area 3 – Tables 22 and 23
- Standalone Sites – Tables 28 and 29

The threshold for diver human health assessment from Parvin (2005) are presented for inshore, offshore, and longshore directions in the following:

- Area 1 – Table 15
- Area 3 – Table 24

The SPL sound fields, and distances to relevant isopleths can be visualised on the contour maps presented in the following:

- Area 1 – Figures 9 to 15
- Area 2 – Figures 16 to 18
- Area 3 –Figures 19 to 24
- Standalone Sites – Figures 25 to 29

The SEL sound fields, and distances to relevant isopleths can be visualised on the contour maps presented in Appendix F.

The SPL sound fields are also presented as vertical slices for selected sites along the endfire and broadside directions out to 100 km, with the airgun array in the centre (Figures 30 to 32).

Maximum distances to maximum-over-depth water column PK thresholds were calculated for twelve modelled single impulse sites, and presented in Tables 16, 21, 25 and 30. Seafloor sound levels were assessed at nine different representative depths within the Operational Area and Tables 17, 18, 26, 27 and 31 to 33 present the PK and PK-PK results.

5.2.1. Tabulated Results

5.2.1.1. Area 1

Table 13. *Area 1, triple 3480 in³ source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth unweighted per-pulse sound exposure level (SEL) isopleths from the modelled single impulse sites, with water depth indicated.

Per-pulse SEL (L_E; dB re 1 µPa²·s)	Site 1 (870 m)		Site 2 (1139 m)		Site 3 (1317 m)		Site 4 (1216 m)		Site 5 (1576 m)		Site 6 (1410 m)		Site 7 (1437 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}
190	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
180	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13
170	0.50	0.43	0.48	0.43	0.48	0.43	0.48	0.43	0.48	0.43	0.48	0.43	0.48	0.43
162[2]	2.22	1.83	1.44	1.34	1.36	1.28	1.42	1.33	1.25	1.14	1.32	1.24	1.31	1.22
160[1]	2.66	2.17	2.83	2.24	2.46	2.28	2.40	2.26	1.76	1.65	2.50	1.73	2.59	2.38
150	12.3	9.71	14.9	8.29	9.74	8.36	10.7	7.71	9.09	7.32	9.02	7.39	13.4	11.6
140	63.0	41.9	49.0	36.0	49.3	34.7	44.9	30.0	57.3	31.1	47.2	32.6	50.5	33.0
130	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/

[1] Low power zone assessment criteria DEWHA (2008).
[2] Squid startle response (Fewtrell and McCauley 2012).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 14. *Area 1, triple 3480 in³ source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth per-pulse sound pressure level (SPL) isopleths from the modelled single impulse sites, with water depth indicated.

SPL (L_p; dB re 1 µPa)	Site 1 (870 m)		Site 2 (1139 m)		Site 3 (1317 m)		Site 4 (1216 m)		Site 5 (1576 m)		Site 6 (1410 m)		Site 7 (1437 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
190	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12
180	0.44	0.38	0.44	0.38	0.44	0.38	0.44	0.38	0.44	0.38	0.44	0.38	0.44	0.38
175[1]	0.81	0.75	0.78	0.67	0.78	0.67	0.78	0.67	0.78	0.67	0.78	0.67	0.78	0.67
170	2.39	1.94	2.16	2.01	1.54	1.44	2.11	1.48	1.39	1.30	1.49	1.39	2.25	1.41
166[2]	4.15	3.22	4.18	3.10	4.09	3.09	4.12	3.21	3.19	3.00	3.92	3.07	3.91	3.11
160[3]	11.3	9.08	7.55	6.42	7.55	5.98	7.39	6.30	8.04	6.33	7.82	6.23	12.2	11.1
150	48.7	34.9	45.6	34.6	47.3	30.3	42.5	25.7	54.8	27.5	45.9	27.5	43.9	28.5
140	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/

[1] Threshold for turtle behavioural disturbance from impulsive noise (McCauley et al. 2000).
[2] Threshold for turtle behavioural response to impulsive noise (NSF 2011).
[3] Marine mammal behavioural threshold for impulsive sound sources (NOAA 2019).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 15. *Area 1,* triple 3480 in^3 source – Maximum (Rmax) horizontal distances (in km) from the seismic source to modelled maximum-over-depth sound pressure level (SPL) threshold for diver human health assessment from Parvin (2005) from the modelled single impulse sites, with array heading indicated.

Direction	R_{max} (km) – range to 145 dB re 1 µPa SPL threshold for divers						
	Site 1 (312°)	Site 2 (312°)	Site 3 (312°)	Site 4 (312°)	Site 5 (132°)	Site 6 (132°)	Site 7 (132°)
Forward/Aft	61.4	51.0	49.9	52.3	42.3	54.9	58.2
Offshore	>100	>100	>100	73.7	>100	75.2	97.9
Inshore	21.3	22.0	20.9	19.9	19.3	22.4	30.2

Table 16. *Area 1, triple 3480 in^3 source* – Maximum (R_{max}) horizontal distances (in km) from the seismic source to modelled maximum-over-depth peak pressure level (PK) thresholds based on Southall et al. (2019) for marine mammals, and Popper et al. (2014) for fish and Finneran et al. (2017) for sea turtles, at Sites 1, 4, and 5 (Table 5), with water depth indicated.

Hearing group	Hearing effect	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (km)		
			Site 1 (870 m)	Site 4 (1216 m)	Site 5 (1576 m)
LF cetaceans	PTS	219	–	–	–
	TTS	213	0.07	0.07	0.07
HF cetaceans	PTS	230	–	–	–
	TTS	224	–	–	–
VHF cetaceans	PTS	202	0.24	0.24	0.24
	TTS	196	0.48	0.48	0.48
Otariid seals	PTS	232	–	–	–
	TTS	226	–	–	–
Sea turtles	PTS	232	–	–	–
	TTS	226	–	–	–
Fish: I	N/A	213	0.07	0.07	0.07
Fish: II, III, Fish eggs, and larvae	N/A	207	0.14	0.14	0.14

A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

Table 17. *Area 1, triple 3480 in^3 source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 50 cm above seafloor) peak pressure level thresholds (PK) at three water depths within Area 1.

Hearing group/animal type	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (m)		
		Site 1 (870 m)	Site 2 (1139 m)	Site 4 (1216 m)
Sound levels for sponges and corals[1]	226	*	*	*
Fish: I	213	*	*	*
Fish: II, III, Fish eggs, and larvae	207	*	*	*

[1] Heyward et al. (2018)
An asterisk indicates that the sound level was not reached.
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

Table 18. *Area 1, triple 3480 in^3 source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 5 cm above seafloor) peak-peak pressure levels (PK-PK) at three water depths within Area 2. Results included in relation to benthic invertebrates.

PK-PK (L_{pk-pk}; dB re 1 µPa)	Distance R_{max} (m)		
	Site 1 (870 m)	Site 2 (1139 m)	Site 4 (1216 m)
213[1,2,3]	*	*	*
212[2,3]	*	*	*
210[1,2]	*	*	*
209[1,2]	*	*	*
202[4]	437	379	358

[1] Day et al. (2019), lobster
[2] Day et al. (2016a), lobster and scallops
[3] Day et al. (2017), scallops.
[4] Payne et al. (2008), lobster
An asterisk indicates that the sound level was not reached.

5.2.1.2. Area 2

Table 19. *Area 2, triple 3480 in^3 source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth unweighted per-pulse sound exposure level (SEL) isopleths from the modelled single impulse sites, with water depth indicated.

Per-pulse SEL (L_E; dB re 1 µPa²·s)	Site 1 (1723 m)		Site 2 (2400 m)		Site 3 (2683 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
190	0.05	0.05	0.05	0.05	0.05	0.05
180	0.15	0.13	0.15	0.13	0.15	0.13
170	0.48	0.42	0.48	0.42	0.48	0.42
162[2]	1.24	1.07	1.24	1.06	1.24	1.06
160[1]	1.56	1.45	1.55	1.33	1.54	1.33
150	8.85	6.93	6.53	4.80	5.20	4.80
140	36.7	25.7	34.9	18.9	31.5	19.3
130	>100	\	>100	\	>100	\

[1] Low power zone assessment criteria DEWHA (2008).
[2] Squid startle response (Fewtrell and McCauley 2012).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 20. *Area 2, triple 3480 in^3 source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth per-pulse sound pressure level (SPL) isopleths from the modelled single impulse sites, with water depth indicated.

SPL (L_p; dB re 1 µPa)	Site 1 (1723 m)		Site 2 (2400 m)		Site 3 (2683 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	0.05	0.04	0.05	0.04	0.05	0.04
190	0.13	0.12	0.13	0.12	0.13	0.12
180	0.44	0.38	0.44	0.38	0.44	0.38
175[1]	0.79	0.67	0.78	0.67	0.78	0.67
170	1.35	1.17	1.34	1.16	1.34	1.16
166[2]	2.26	2.12	2.14	1.98	2.13	1.85
160[3]	6.61	4.90	4.45	4.11	4.49	4.19
150	26.4	20.8	22.1	16.3	21.3	16.3
140	94.8	80.3	>100	\	>100	\

[1] Threshold for turtle behavioural disturbance from impulsive noise (McCauley et al. 2000).
[2] Threshold for turtle behavioural response to impulsive noise (NSF 2011).
[3] Marine mammal behavioural threshold for impulsive sound sources (NOAA 2019).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 21. *Area 2, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in km) from the seismic source to modelled maximum-over-depth peak pressure level (PK) thresholds based on Southall et al. (2019) for marine mammals, and Popper et al. (2014) for fish and Finneran et al. (2017) for sea turtles, at Site 1 (Table 5), with water depth indicated.

Hearing group	Hearing effect	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (km)
			Site 1 (1723 m)
LF cetaceans	PTS	219	–
	TTS	213	0.07
HF cetaceans	PTS	230	–
	TTS	224	–
VHF cetaceans	PTS	202	0.24
	TTS	196	0.48
Otariid seals	PTS	232	–
	TTS	226	–
Sea turtles	PTS	232	–
	TTS	226	–
Fish: I	N/A	213	0.07
Fish: II, III, Fish eggs, and larvae	N/A	207	0.14

A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

5.2.1.3. Area 3

Table 22. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth unweighted per-pulse sound exposure level (SEL) isopleths from the modelled single impulse sites, with water depth indicated.

Per-pulse SEL (L_E; dB re 1 µPa²·s)	Site 1 (569 m)		Site 2 (903 m)		Site 3 (998 m)		Site 4 (674 m)		Site 5 (1015 m)		Site 6 (1223 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
190	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
180	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13
170	0.52	0.49	0.49	0.43	0.49	0.43	0.49	0.43	0.49	0.43	0.49	0.43
162[2]	2.24	1.71	2.30	1.83	1.98	1.85	2.34	1.84	1.43	1.34	1.33	1.24
160[1]	2.79	2.16	2.88	2.21	2.88	2.24	2.92	2.28	2.61	2.23	1.83	1.70
150	12.1	9.20	19.2	16.1	12.2	7.59	14.8	9.38	11.3	7.51	10.0	8.11
140	80.0	63.5	63.0	40.0	50.8	36.3	42.1	32.6	50.3	40.5	59.5	29.7
130	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/

[1] Low power zone assessment criteria DEWHA (2008).
[2] Squid startle response (Fewtrell and McCauley 2012).

A slash indicates that R95% radius to threshold is not reported when the Rmax is greater than the maximum modelling extent.

Table 23. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth per-pulse sound pressure level (SPL) isopleths from the modelled single impulse sites, with water depth indicated.

SPL (L_p; dB re 1 µPa)	Site 1 (569 m)		Site 2 (903 m)		Site 3 (998 m)		Site 4 (674 m)		Site 5 (1015 m)		Site 6 (1223 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
190	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12
180	0.43	0.39	0.43	0.38	0.43	0.38	0.43	0.38	0.43	0.38	0.43	0.38
175[1]	1.37	1.13	0.82	0.77	0.79	0.71	0.89	0.83	0.79	0.68	0.78	0.67
170	2.50	1.89	2.51	1.96	2.45	2.00	2.59	2.03	2.14	1.52	1.50	1.41
166[2]	3.83	3.19	4.06	3.07	4.07	3.18	3.85	2.97	4.15	3.26	3.99	3.01
160[3]	9.33	6.93	8.17	6.22	7.23	6.07	8.60	6.58	8.44	5.94	8.96	6.58
150	45.7	34.0	42.2	31.2	38.2	25.9	38.3	23.1	42.9	27.1	33.9	26.7
140	>100	/	>100	/	>100	/	>100	/	>100	/	>100	/

[1] Threshold for turtle behavioural disturbance from impulsive noise (McCauley et al. 2000).
[2] Threshold for turtle behavioural response to impulsive noise (NSF 2011).
[3] Marine mammal behavioural threshold for impulsive sound sources (NOAA 2019).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 24. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in km) from the seismic source to modelled maximum-over-depth sound pressure level (SPL) threshold for diver human health assessment from Parvin (2005) from the modelled single impulse sites, with array heading indicated.

Direction	R_{max} (km) – range to 145 dB re 1 µPa SPL threshold for divers					
	Site 1 (305°)	Site 2 (305°)	Site 3 (305°)	Site 4 (305°)	Site 5 (125°)	Site 6 (125°)
Forward/Aft	40.9	45.1	41.4	44.4	41.1	47.0
Offshore	>100	>100	58.3	75.1	58.9	83.7
Inshore	12.5	13.0	15.9	22.9	27.3	21.2

Table 25. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in km) from the seismic source to modelled maximum-over-depth peak pressure level (PK) thresholds based on Southall et al. (2019) for marine mammals, and Popper et al. (2014) for fish and Finneran et al. (2017) for sea turtles, at Sites 1, 3, and 6 (Table 5), with water depth indicated.

Hearing group	Hearing effect	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (km)		
			A04S01 (391 m)	A04S04 (580 m)	A04S06 (1317 m)
LF cetaceans	PTS	219	–	–	–
	TTS	213	0.07	0.07	0.07
HF cetaceans	PTS	230	–	–	–
	TTS	224	–	–	–
VHF cetaceans	PTS	202	0.24	0.24	0.24
	TTS	196	0.48	0.48	0.48
Otariid seals	PTS	232	–	–	–
	TTS	226	–	–	–
Sea turtles	PTS	232	–	–	–
	TTS	226	–	–	–
Fish: I	N/A	213	0.07	0.07	0.07
Fish: II, III, Fish eggs, and larvae	N/A	207	0.14	0.14	0.14

A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

Table 26. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 50 cm above seafloor) peak pressure level thresholds (PK) at three Sites with water depth indicated.

Hearing group/animal type	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (m)		
		Site 1 (569 m)	Site 2 (903 m)	Site 4 (674 m)
Sound levels for sponges and corals[1]	226	*	*	*
Fish: I	213	*	*	*
Fish: II, III, Fish eggs, and larvae	207	*	*	*

[1] Heyward et al. (2018)
An asterisk indicates that the sound level was not reached.
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

Table 27. *Area 3, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 50 cm above seafloor) peak-peak pressure levels (PK-PK) at three water depths within the Active Source Zone. Results included in relation to benthic invertebrates.

PK-PK ($L_{pk\text{-}pk}$; dB re 1 µPa)	Distance R_{max} (m)		
	Site 1 (569 m)	Site 2 (903 m)	Site 4 (674 m)
213[1,2,3]	*	*	*
212[2,3]	*	*	*
210[1,2]	116	*	29
209[1,2]	157	*	105
202[4]	512	433	489

[1] Day et al. (2019), lobster
[2] Day et al. (2016a), lobster and scallops
[3] Day et al. (2017), scallops.
[4] Payne et al. (2008), lobster
An asterisk indicates that the sound level was not reached.

5.2.1.4. Standalone Sites

Table 28. *Standalone Sites, triple 3480 in³ source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from seismic source to modelled maximum-over-depth and maximum-over-azimuth unweighted per-pulse sound exposure level (SEL) isopleths from the modelled single impulse sites, with water depth indicated.

Per-pulse SEL (L_E; dB re 1 µPa²·s)	Site 1 (3332 m)		Site 2 (4252 m)		Site 3 (3728 m)		Site 4 (2276 m)		Site 5 (114 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
190	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.05
180	0.14	0.13	0.15	0.13	0.14	0.13	0.14	0.13	0.26	0.24
170	0.49	0.42	0.48	0.42	0.48	0.42	0.48	0.42	0.68	0.61
162[2]	1.23	1.05	1.24	1.05	1.23	1.05	1.24	1.06	1.41	1.28
160[1]	1.55	1.32	1.54	1.32	1.54	1.32	1.56	1.33	1.68	1.56
150	5.23	4.82	5.23	4.91	5.27	4.93	6.40	4.88	4.15	3.36
140	24.8	20.3	26.1	21.4	24.6	20.5	44.1	23.2	9.64	8.00
130	>100	/	>100	/	>100	/	>100	/	27.1	22.7

[1] Low power zone assessment criteria DEWHA (2008).
[2] Squid startle response (Fewtrell and McCauley 2012).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 29. *Standalone Sites, triple 3480 in^3 source* – Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the seismic source to modelled maximum-over-depth and maximum-over-azimuth per-pulse sound pressure level (SPL) isopleths from the modelled single impulse sites, with water depth indicated.

SPL (L_p; dB re 1 µPa)	Site 1 (3332 m)		Site 2 (4252 m)		Site 3 (3728 m)		Site 4 (2276 m)		Site 5 (114 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	R_{max}
200	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.05	0.05
190	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.12	0.23	0.22
180	0.43	0.38	0.44	0.38	0.43	0.38	0.43	0.38	0.62	0.54
175[1]	0.79	0.67	0.79	0.67	0.78	0.67	0.78	0.67	0.93	0.87
170	1.37	1.18	1.37	1.18	1.37	1.17	1.36	1.17	1.36	1.26
166[2]	2.18	1.87	2.17	1.86	2.17	1.87	2.18	2.04	1.84	1.67
160[3]	4.56	4.23	4.45	4.19	4.56	4.28	4.44	4.09	3.15	2.68
150	22.6	17.0	24.6	20.2	23.1	19.5	38.5	19.5	8.92	6.65
140	62.8	58.7	62.9	59.1	62.1	57.5	62.2	43.9	12.4	10.0

[1] Threshold for turtle behavioural disturbance from impulsive noise (McCauley et al. 2000).
[2] Threshold for turtle behavioural response to impulsive noise (NSF 2011).
[3] Marine mammal behavioural threshold for impulsive sound sources (NOAA 2019).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 30. *Standalone Sites, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in km) from the seismic source to modelled maximum-over-depth peak pressure level (PK) thresholds based on Southall et al. (2019) for marine mammals, and Popper et al. (2014) for fish and Finneran et al. (2017) for sea turtles, at Sites 1–5 (Table 5), with water depth indicated.

Hearing group	Hearing effect	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (km)				
			Site 1 (3332 m)	Site 2 (4252 m)	Site 3 (3728 m)	Site 4 (2276 m)	Site 5 (114 m)
LF cetaceans	PTS	219	–	–	–	–	–
	TTS	213	0.07	0.07	0.07	0.07	0.07
HF cetaceans	PTS	230	–	–	–	–	–
	TTS	224	–	–	–	–	–
VHF cetaceans	PTS	202	0.24	0.24	0.24	0.24	0.36
	TTS	196	0.48	0.47	0.48	0.48	0.68
Otariid seals	PTS	232	–	–	–	–	–
	TTS	226	–	–	–	–	–
Sea turtles	PTS	232	–	–	–	–	–
	TTS	226	–	–	–	–	–
Fish: No swim bladder (also applied to sharks)	N/A	213	0.07	0.07	0.07	0.07	0.07
Fish: Swim bladder not involved in hearing, Swim bladder involved in hearing Fish eggs, and larvae	N/A	207	0.14	0.14	0.14	0.14	0.15

A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).

Table 31. *Standalone Sites, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 50 cm above seafloor) peak pressure level thresholds (PK) at single Site with water depth indicated.

Hearing group/animal type	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (m)
		Site 5 (114 m)
Sound levels for sponges and corals[1]	226	*
Fish: I	213	75
Fish: II, III, Fish eggs, and larvae	207	156

[1] Heyward et al. (2018)
An asterisk indicates that the sound level was not reached.
Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.

Table 32. *Standalone Sites, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 50 cm above seafloor) peak-peak pressure levels (PK-PK) at single water depth within the Active Source Zone. Results included in relation to benthic invertebrates.

PK-PK (L_{pk-pk}; dB re 1 µPa)	Distance R_{max} (m)
	Site 5 (114 m)
213[1,2,3]	152
212[2,3]	165
210[1,2]	190
209[1,2]	211
202[4]	385

[1] Day et al. (2019), lobster
[2] Day et al. (2016a), lobster and scallops
[3] Day et al. (2017), scallops.
[4] Payne et al. (2008), lobster
An asterisk indicates that the sound level was not reached.

5.2.1.5. 2D Tie-Line

Table 33. *2D tie-line, triple 3480 in³ source* – Maximum (R_{max}) horizontal distances (in m) from the seismic source to modelled seafloor (receiver located 5 cm above seafloor) peak-peak pressure levels (PK-PK) at two water depths along the tie-line. Results included in relation to benthic invertebrates.

PK-PK (L_{pk-pk}; dB re 1 µPa)	Distance R_{max} (m)	
	Site 1 (220 m)	Site 2 (450 m)
213[1,2,3]	128	58
212[2,3]	156	93
210[1,2]	210	151
209[1,2]	238	185
202[4]	676	533

[1] Day et al. (2019), lobster
[2] Day et al. (2016a), lobster and scallops
[3] Day et al. (2017), scallops.
[4] Payne et al. (2008), lobster
An asterisk indicates that the sound level was not reached.

5.2.2. Sound Field Maps and Graphs

5.2.2.1. Area 1

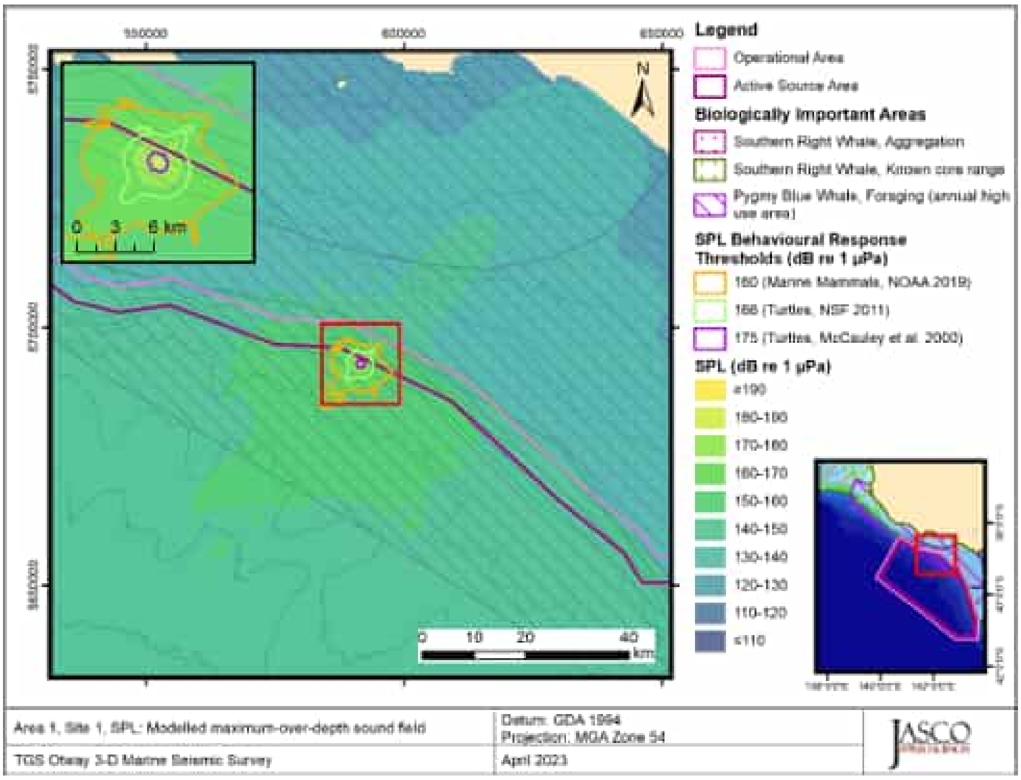


Figure 9. *Area 1*, *Site 1, triple 3480 in*^{3} *source, tow azimuth 312º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

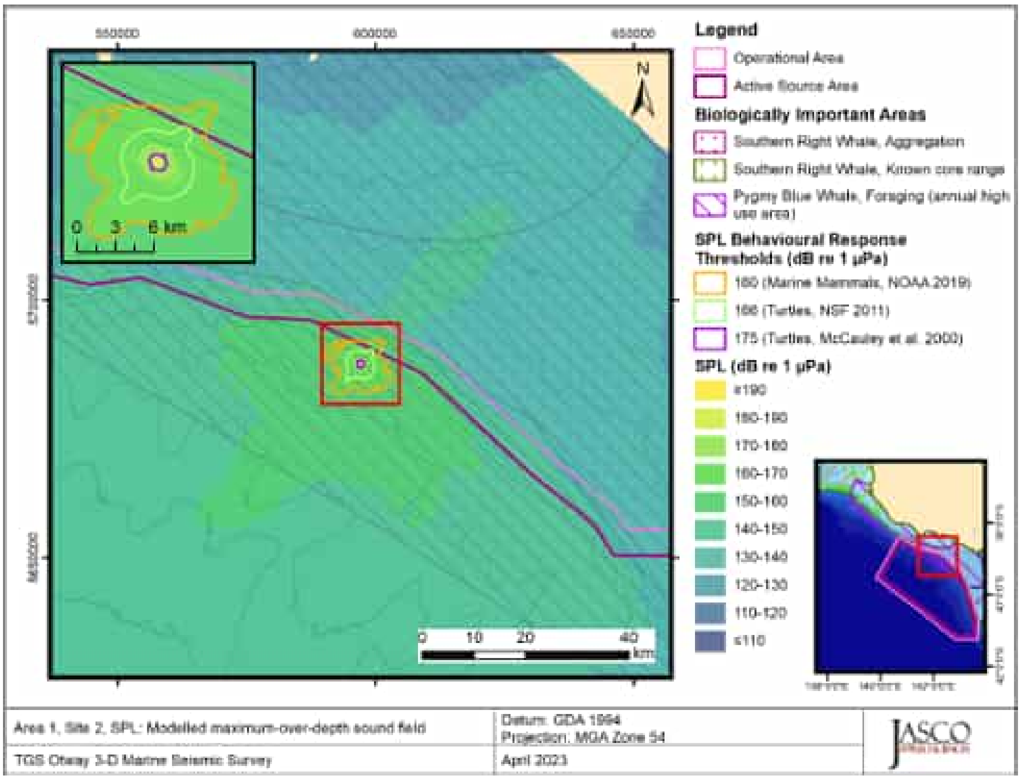


Figure 10. *Area 1, Site 2, triple 3480 in³ source, tow azimuth 312º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

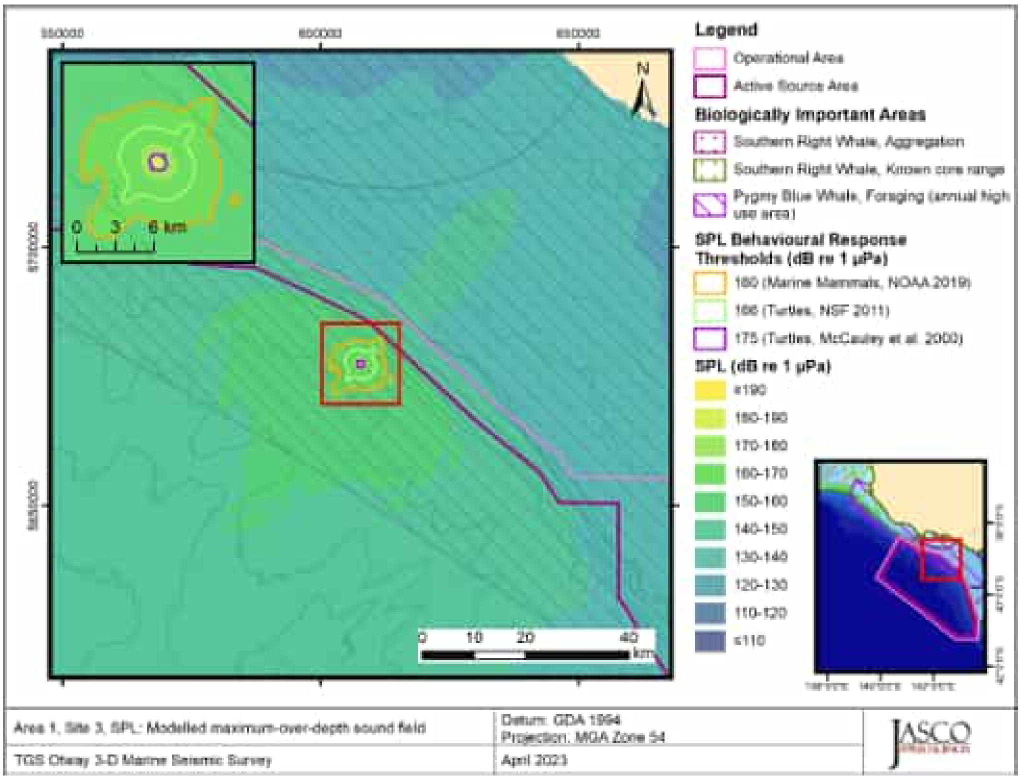


Figure 11. *Area 1, Site 3, triple 3480 in³ source, tow azimuth 312º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

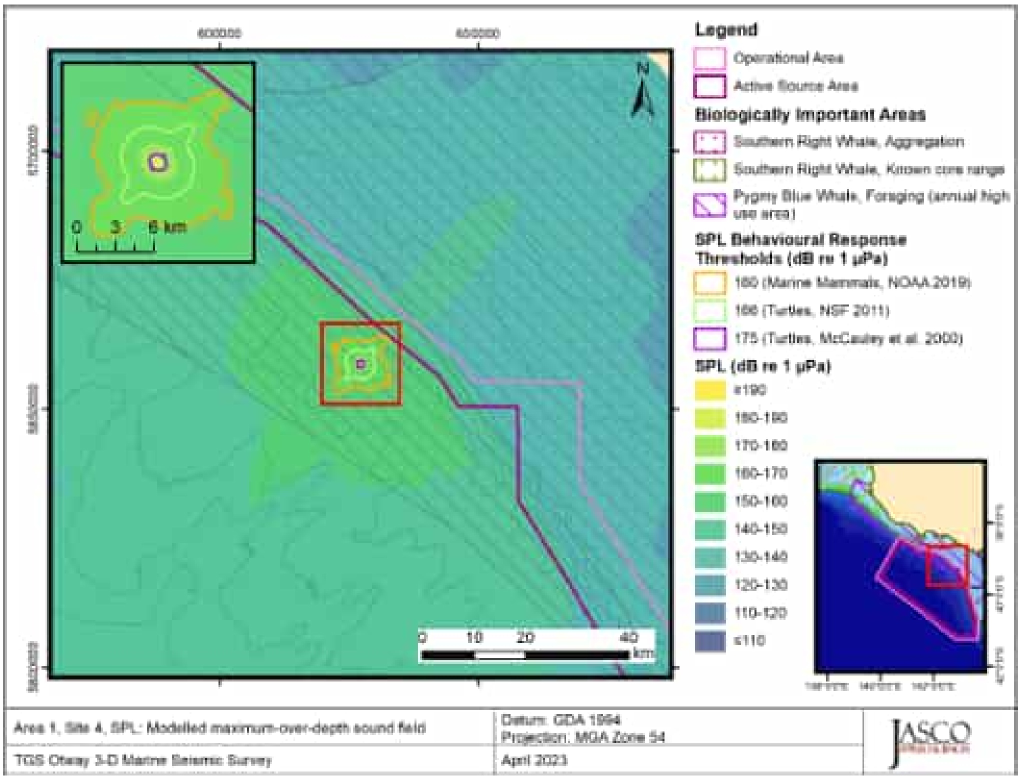


Figure 12. *Area 1, Site 4, triple 3480 in³ source, tow azimuth 312°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

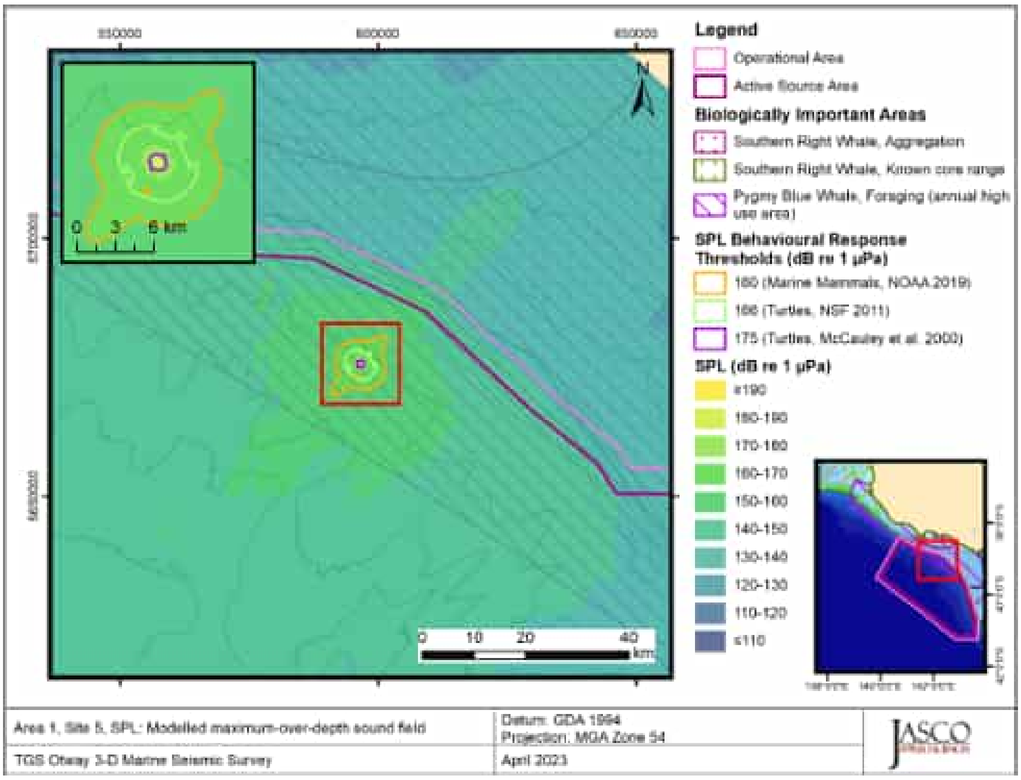


Figure 13. *Area 1, Site 5, triple 3480 in³ source, tow azimuth 132°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

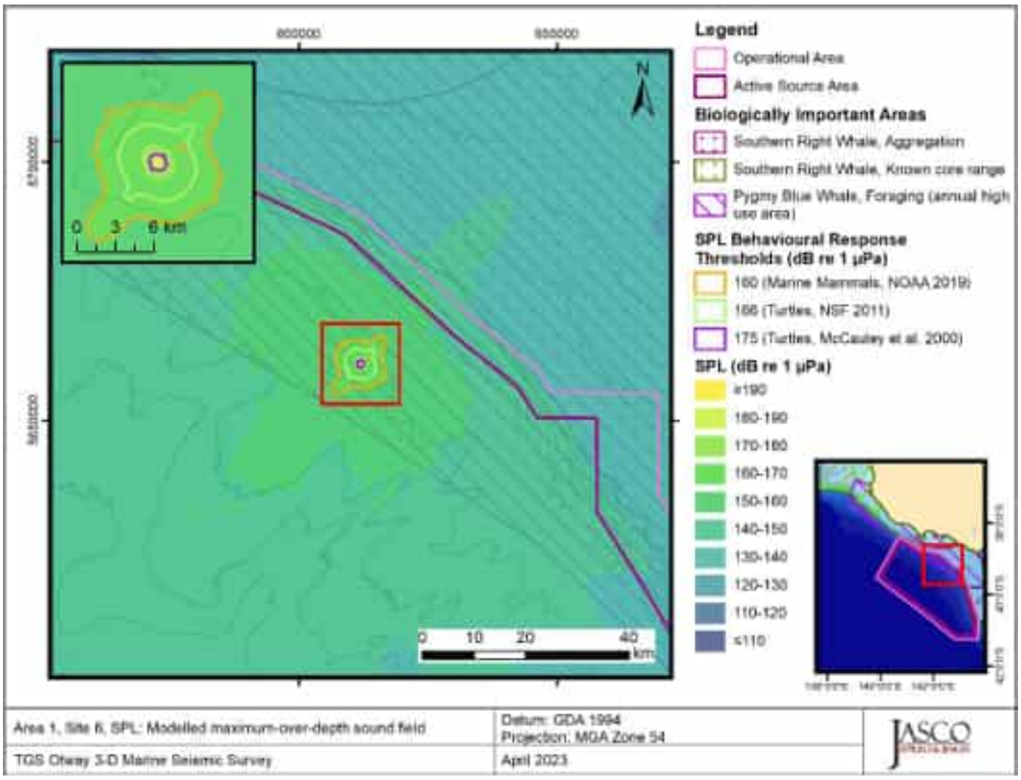


Figure 14. *Area 1, Site 6, triple 3480 in³ source, tow azimuth 132º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

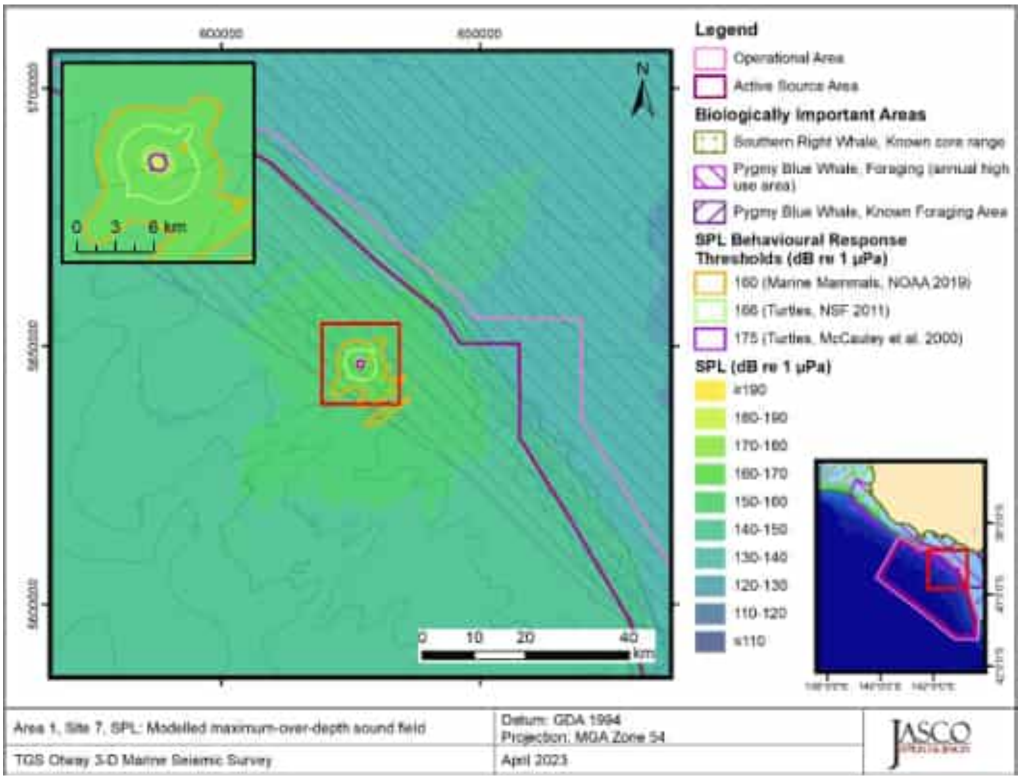


Figure 15. *Area 1, Site 7, triple 3480 in³ source, tow azimuth 132º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

5.2.2.2. Area 2

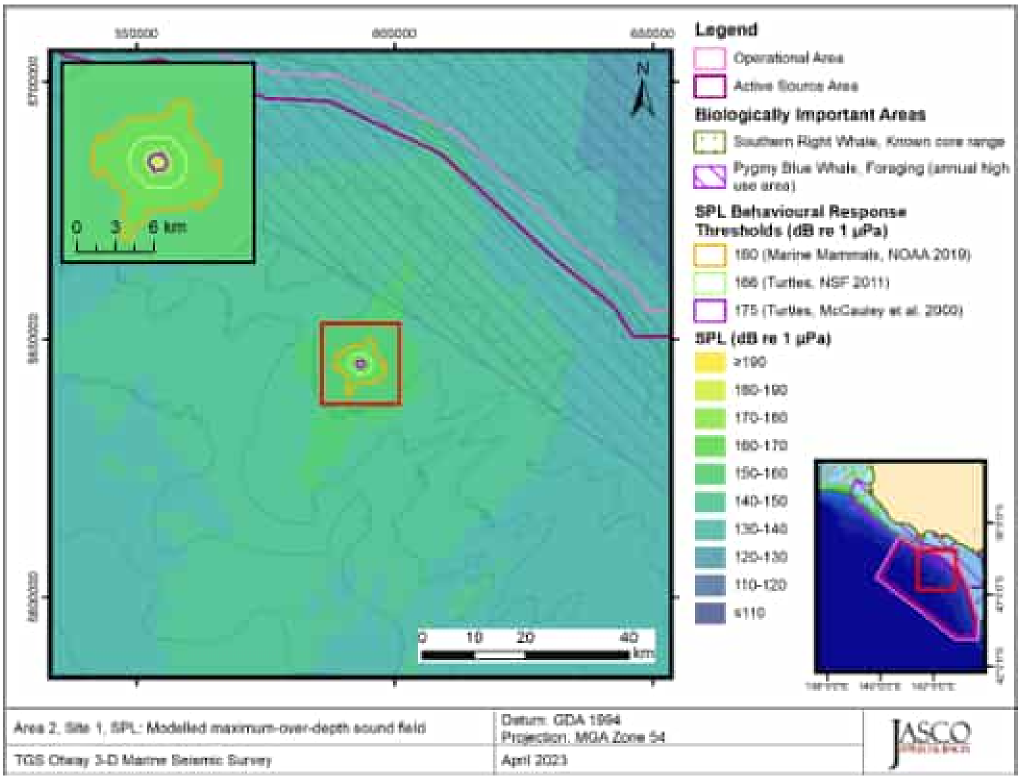


Figure 16. *Area 2, Site 1, triple 3480 in^3 source, tow azimuth 294°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

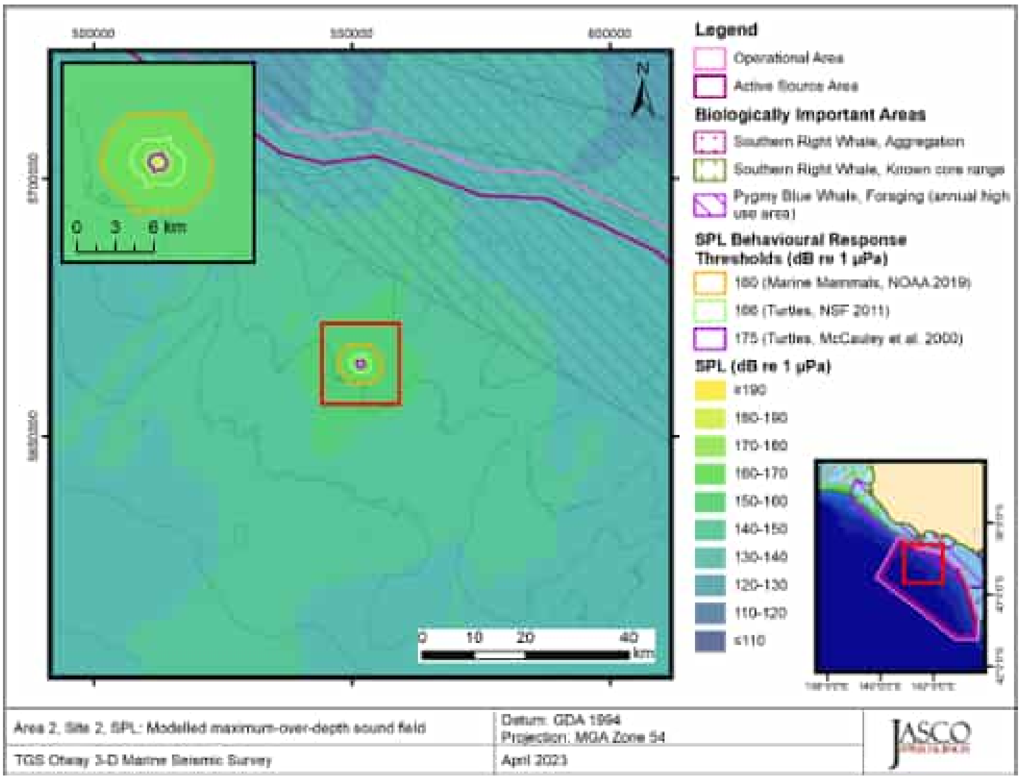


Figure 17. *Area 2, Site 2, triple 3480 in^3 source, tow azimuth 294°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

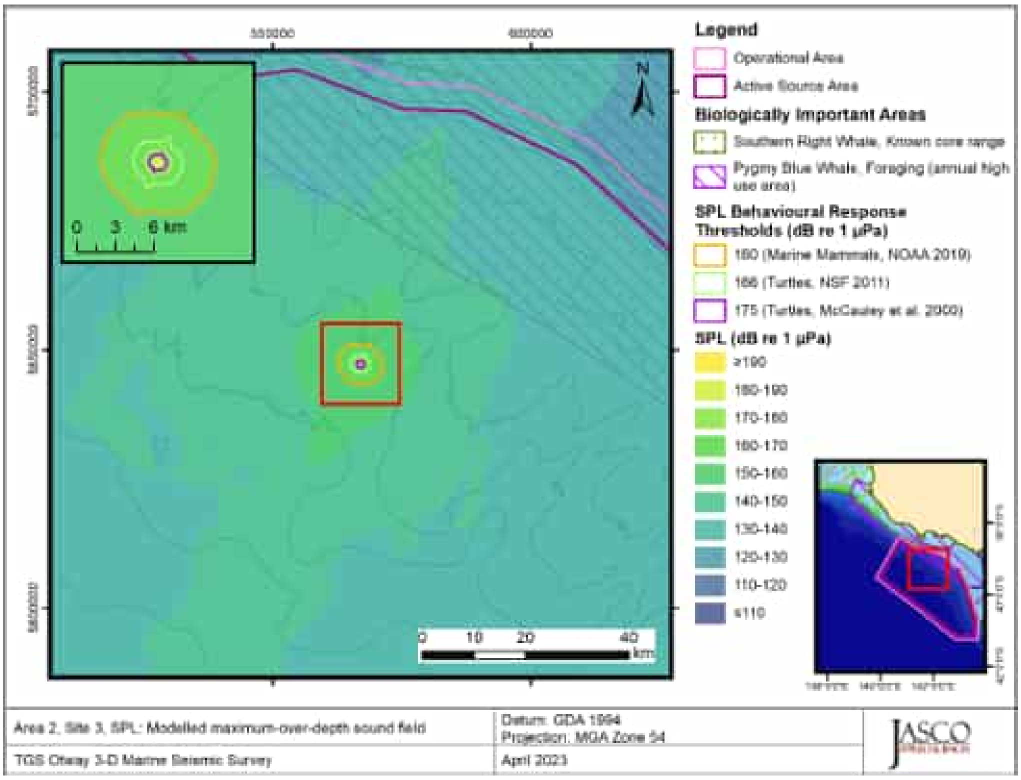


Figure 18. *Area 2, Site 3, triple 3480 in^3 source, tow azimuth 114°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

5.2.2.3. Area 3

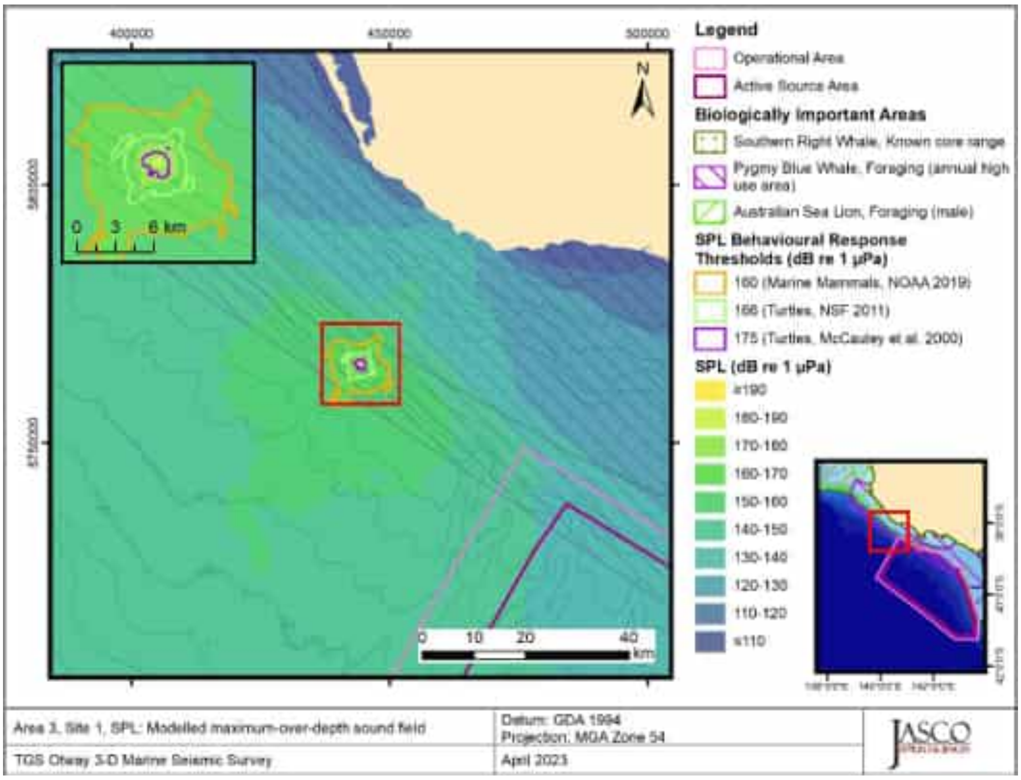


Figure 19. *Area 3, Site 1, triple 3480 in³ source, tow azimuth 305º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

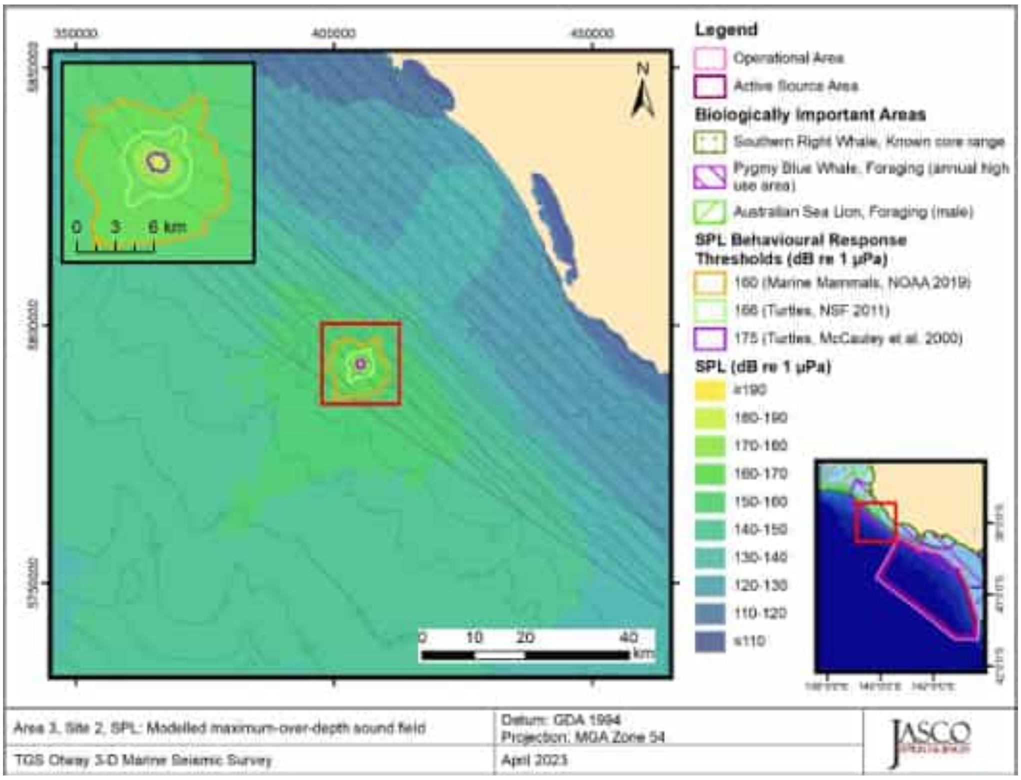


Figure 20. *Area 3, Site 2, triple 3480 in³ source, tow azimuth 305º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

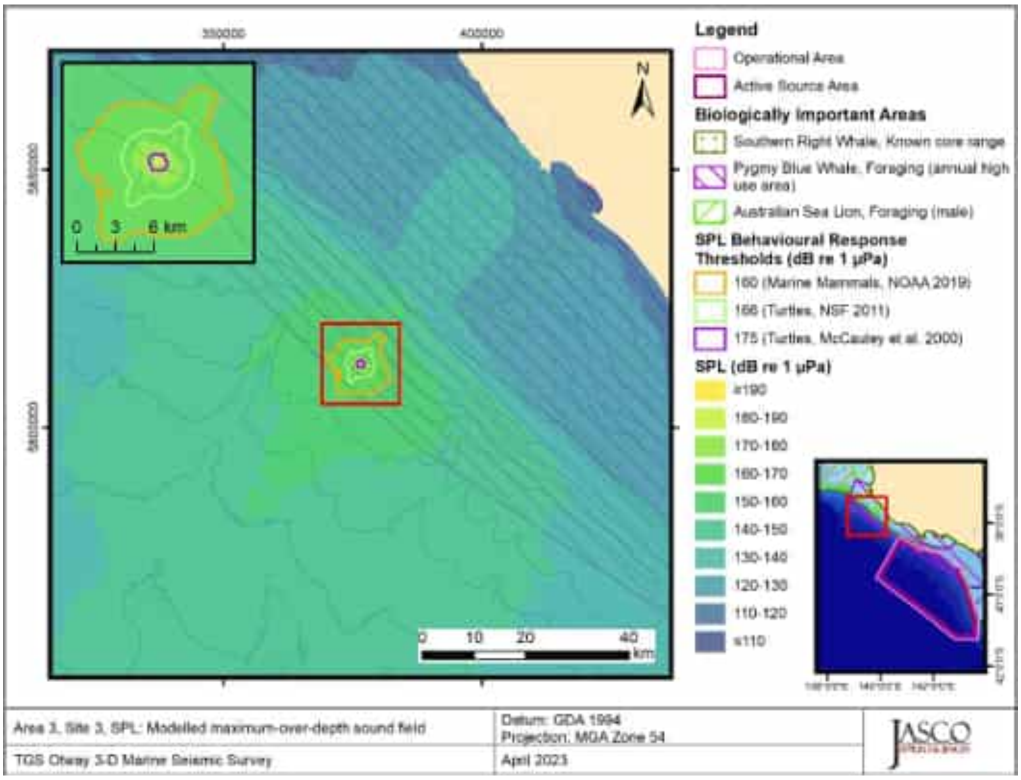


Figure 21. *Area 3, Site 3, triple 3480 in³ source, tow azimuth 305º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

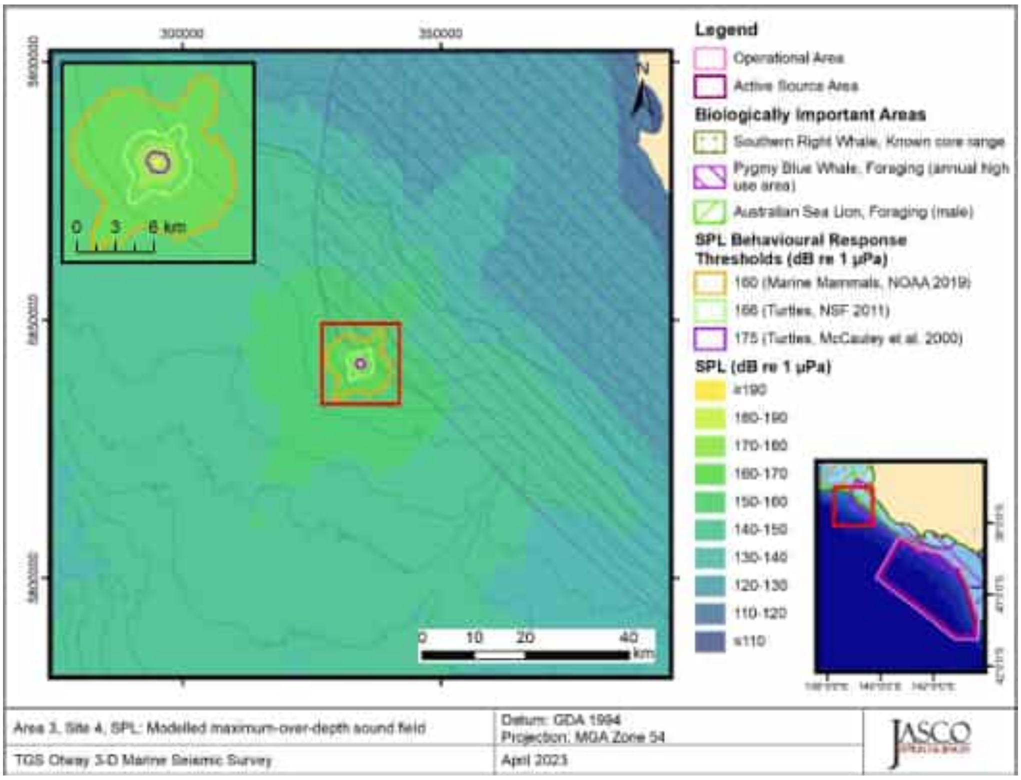


Figure 22. *Area 3, Site 4, triple 3480 in³ source, tow azimuth 305°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

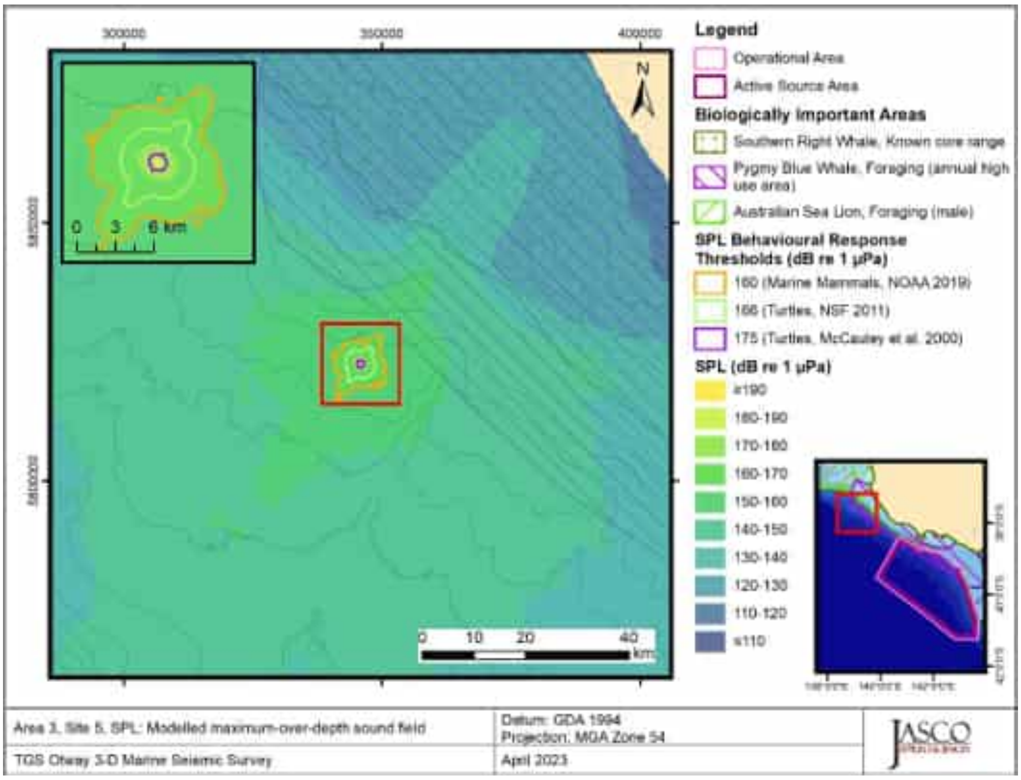


Figure 23. *Area 3, Site 5, triple 3480 in³ source, tow azimuth 125°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

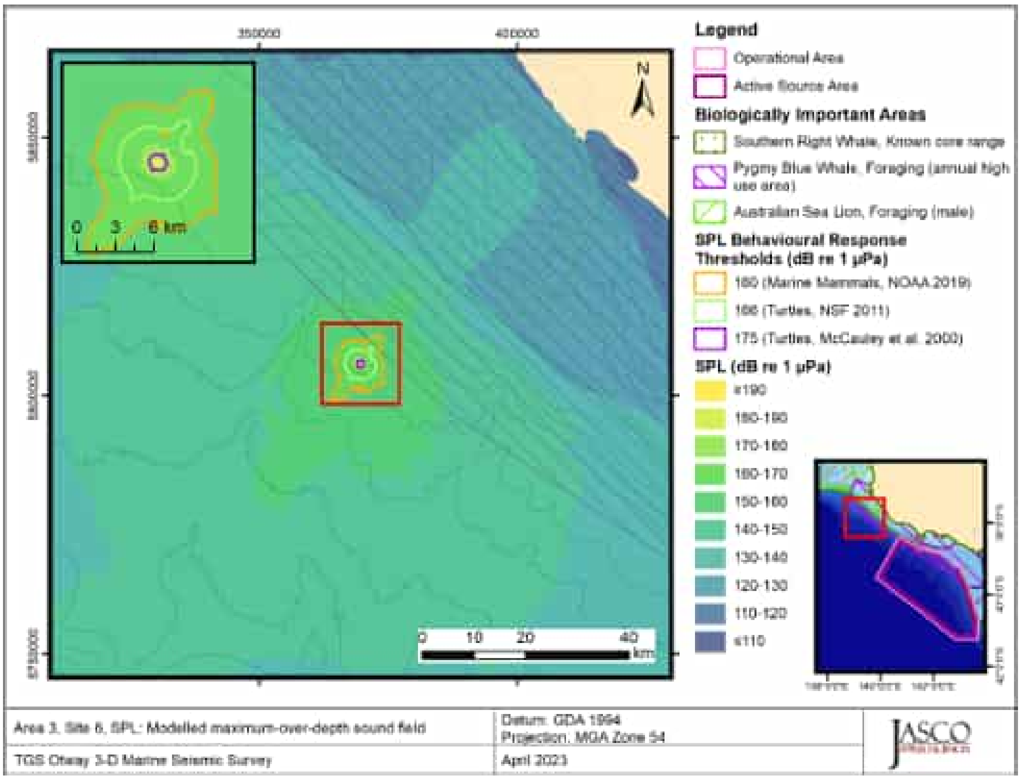


Figure 24. *Area 3, Site 6, triple 3480 in³ source, tow azimuth 125°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

5.2.2.4. Standalone Sites

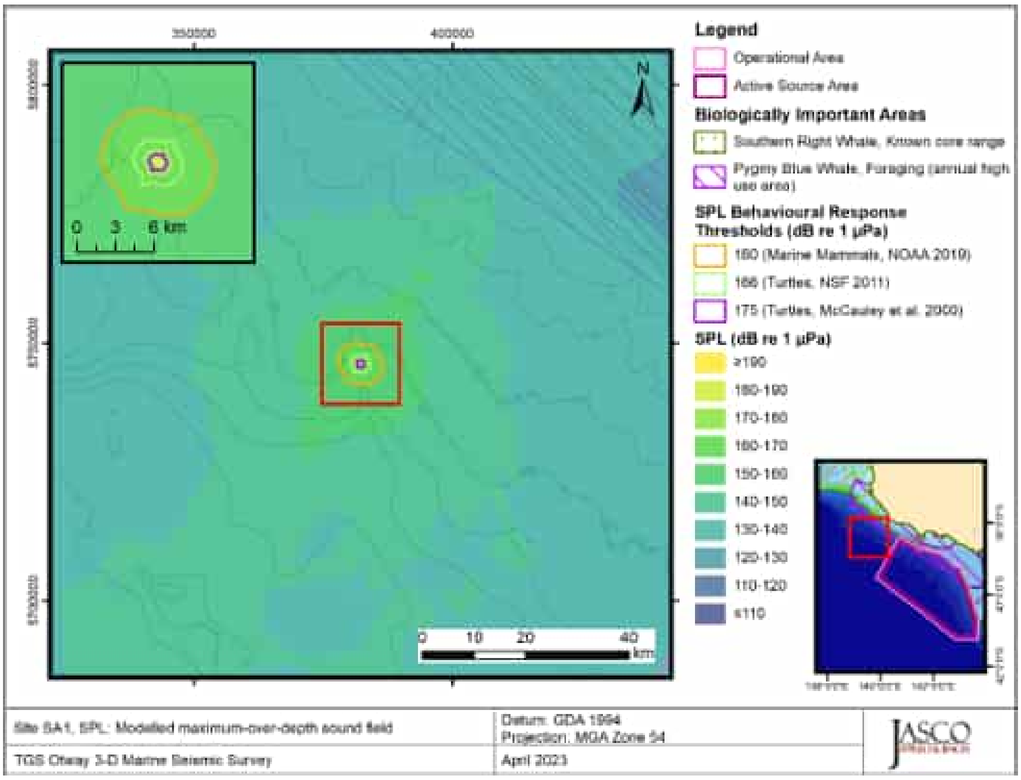


Figure 25. *Standalone Site 1, triple 3480 in³ source, tow azimuth 305º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

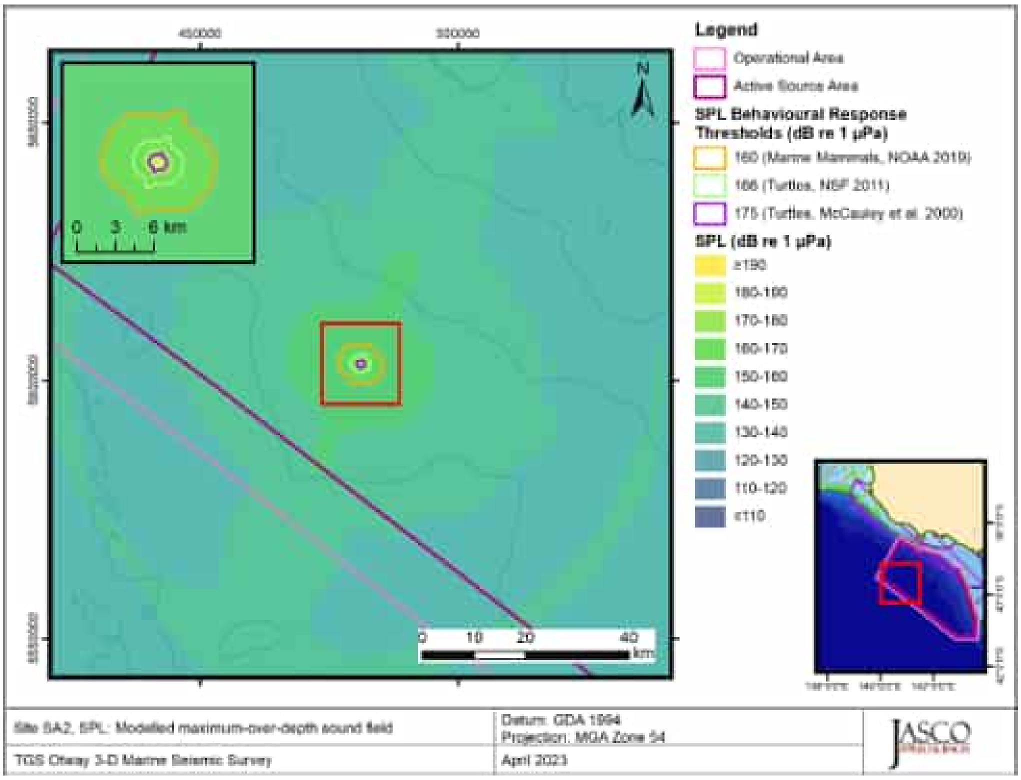


Figure 26. *Standalone Site 2, triple 3480 in³ source, tow azimuth 292º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

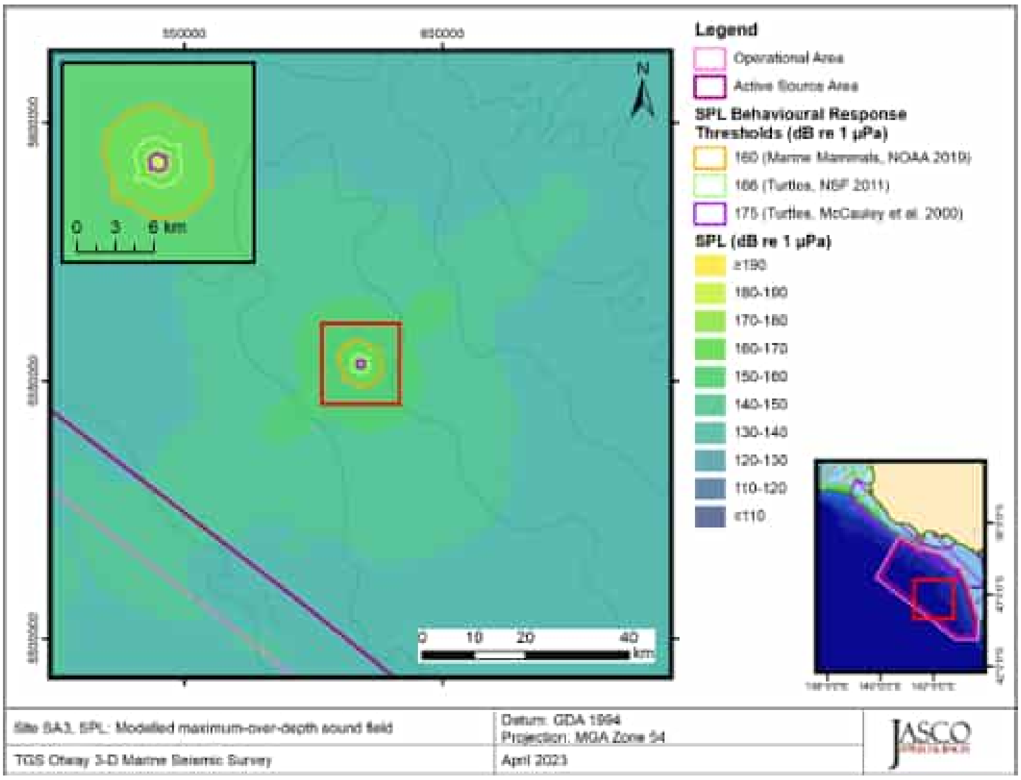


Figure 27. *Standalone Site 3, triple 3480 in³ source, tow azimuth 322º, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

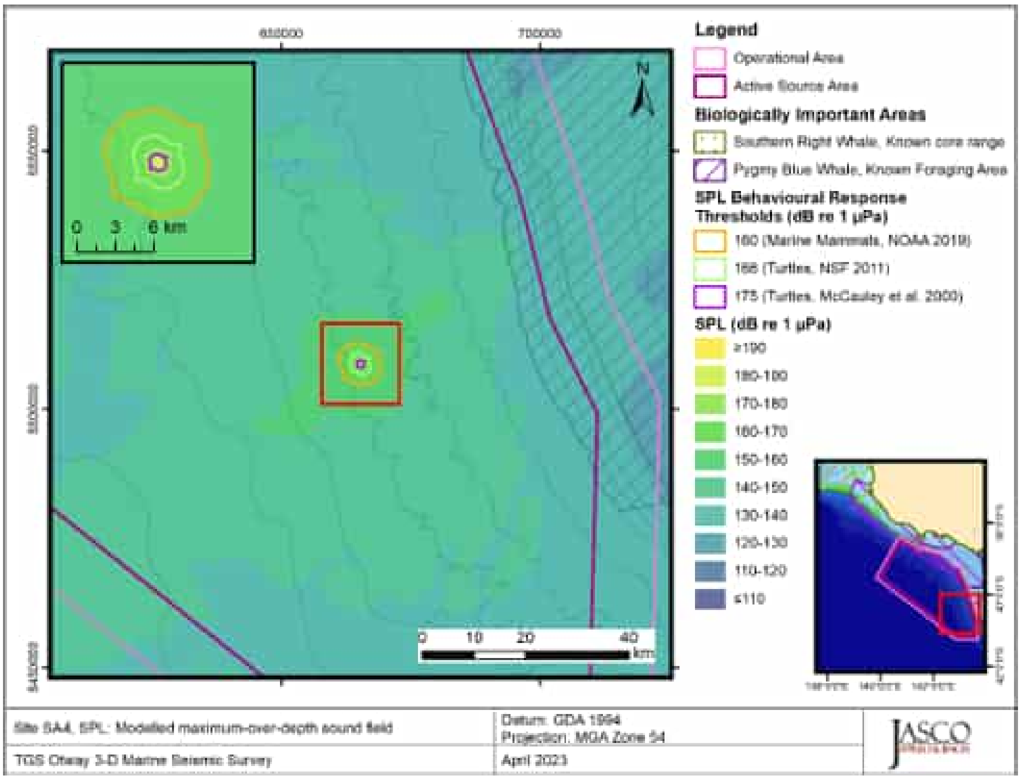


Figure 28. *Standalone Site 4, triple 3480 in³ source, tow azimuth 322°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

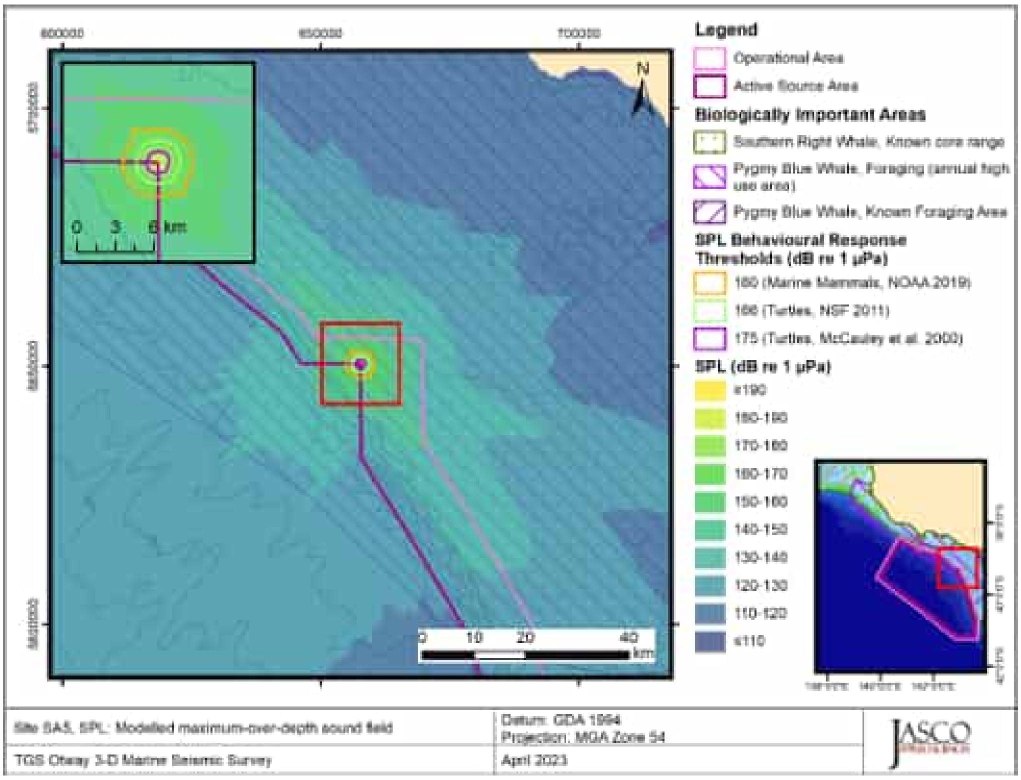


Figure 29. *Standalone Site 5, triple 3480 in³ source, tow azimuth 232°, SPL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth of behavioural response thresholds for marine mammals.

5.2.2.5. Vertical Slices of Modelled Sound Fields

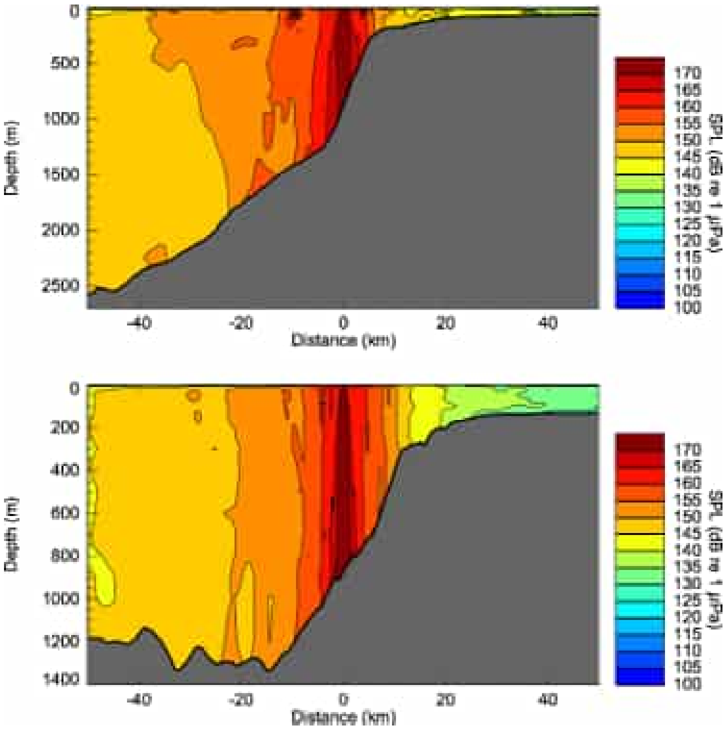


Figure 30. *Area 1*, *Site 1, tow azimuth 312°, 3480 in^3 array, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in each slice is 90° clockwise from the tow azimuth for broadside, and the tow azimuth for the endfire slice.

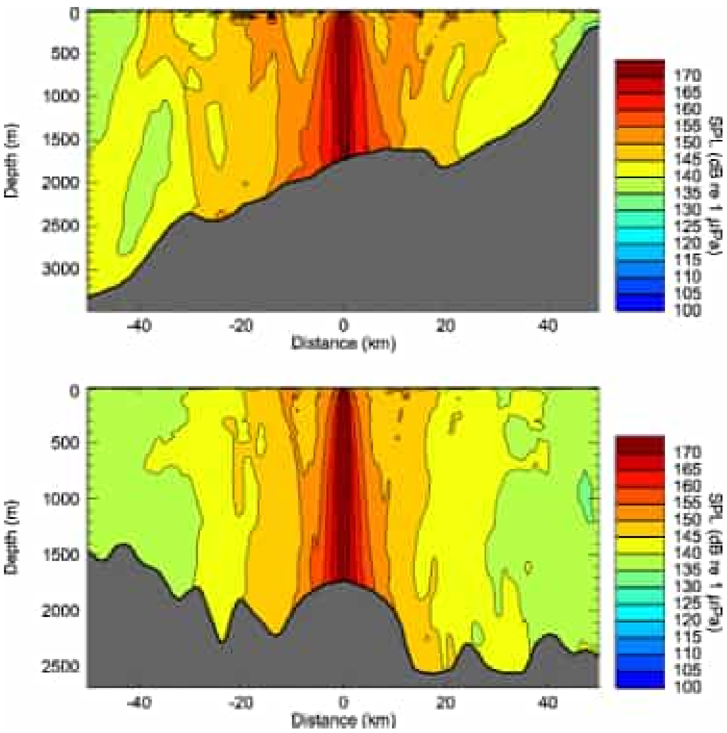


Figure 31. *Area 2, Site 1, tow azimuth 294°, 3480 in^3 array, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in each slice is 90° clockwise from the tow azimuth for broadside, and the tow azimuth for the endfire slice.

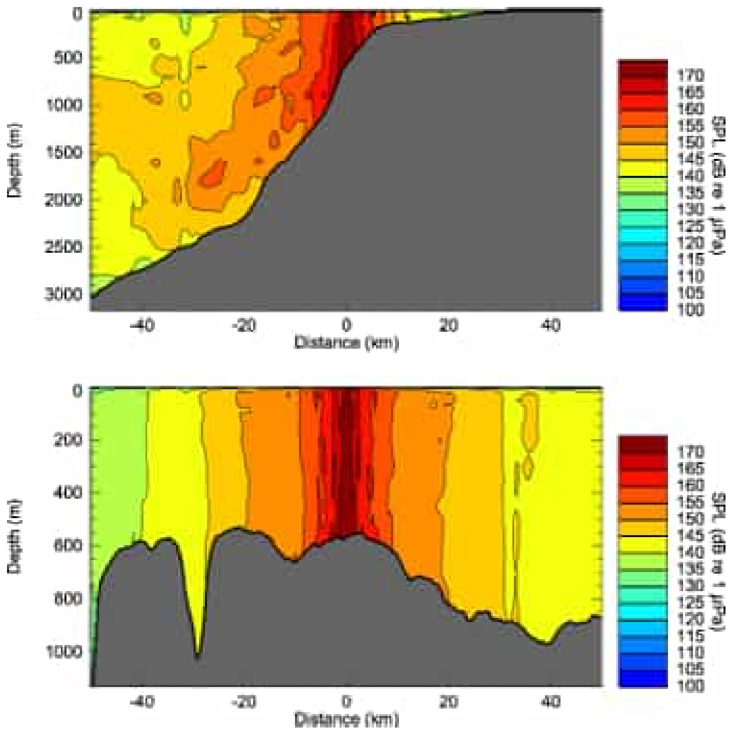


Figure 32. *Area 3, Site 1, tow azimuth 305°, 3480 in^3 array, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in each slice is 90° clockwise from the tow azimuth for broadside, and the tow azimuth for the endfire slice.

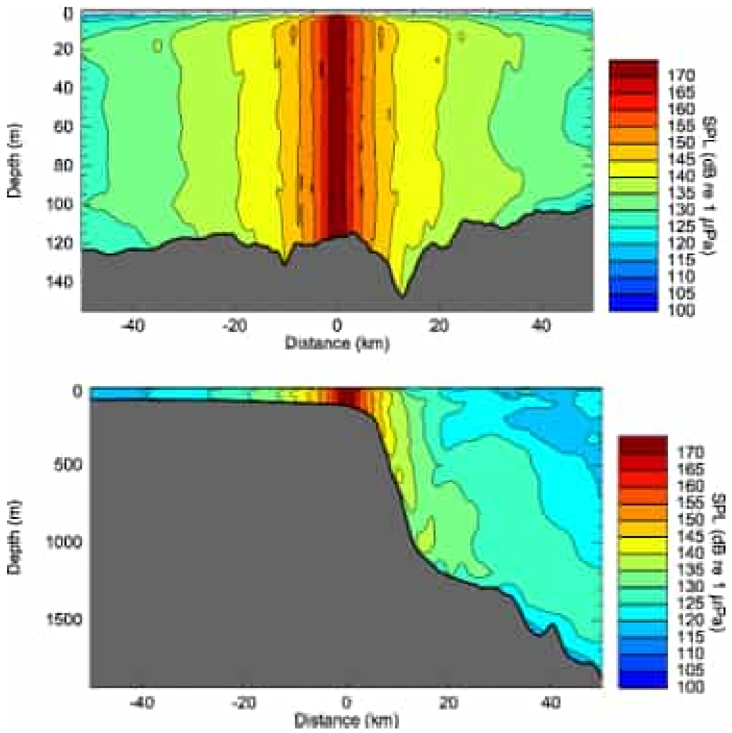


Figure 33. *Standalone Site 5, tow azimuth 232°, 3480 in^3 array, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in each slice is 90° clockwise from the tow azimuth for broadside, and the tow azimuth for the endfire slice.

5.2.3. Particle Motion

Figures 34 to 42 show modelled maximum particle acceleration as a function of horizontal range in four perpendicular directions from the centre of the triple 3480 in^3 seismic source at the seafloor sites (Table 5). The modelling considered a resolution of 10 m, and a receiver positioned 5 cm off the seafloor. The maximum distance to a particle acceleration of 37.57 ms^{-2} from (Day et al. 2016a) is not predicted to occur at any range for Site 1 in Area 1 and the ranges for all other sites is shown in Table 34.

Table 34. Maximum horizontal distances (m) from the triple 3480 in^3 seismic source to modelled maximum-over-depth and maximum over azimuth particle acceleration threshold (Day et al. (2016a)) from the modelled single impulse sites, with water depth indicated.

Particle acceleration (m/s^2)	Area 1			Area 3			Standalone and 2D tie-line		
	Site 1 (870 m)	Site 2 (1139 m)	Site 4 (1216 m)	Site 1 (569 m)	Site 2 (903 m)	Site 4 (674 m)	SA5 (114 m)	TL01 (220 m)	TL02 (450 m)
37.57	*	*	*	*	*	*	*	*	*

An asterisk indicates that the sound level was not reached.

5.2.3.1. Area 1

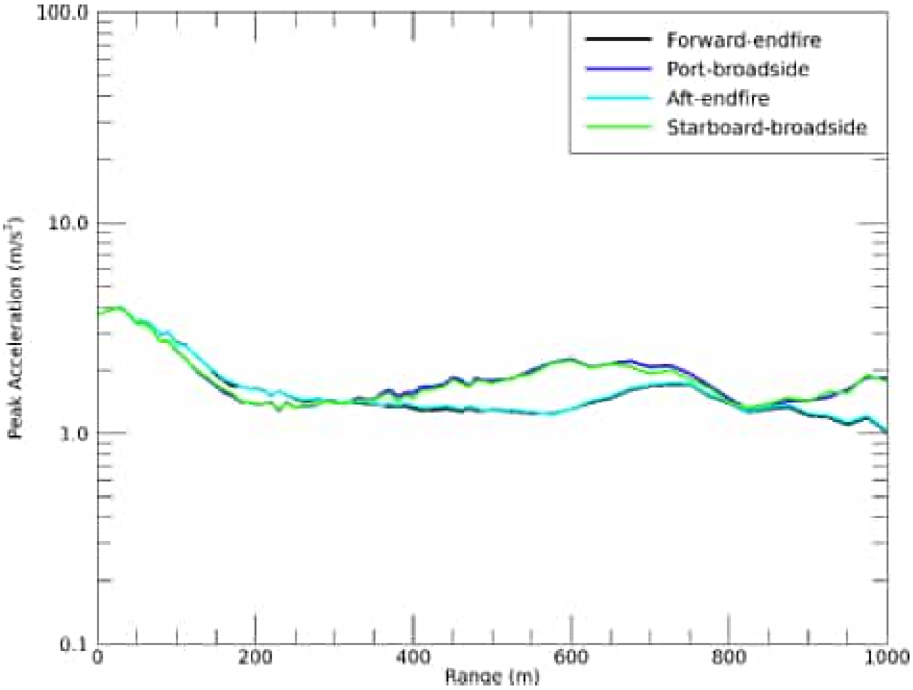


Figure 34. *Area 1, Site 1, triple 3480 in^3 seismic source at 870 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

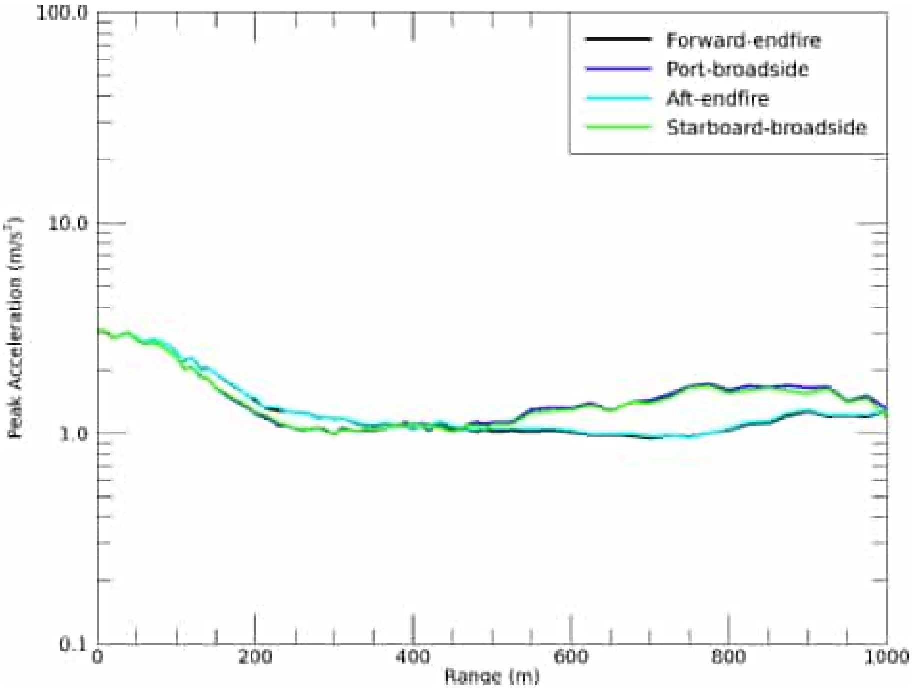


Figure 35. *Area 1, Site 2, triple 3480 in^3 seismic source at 1139 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

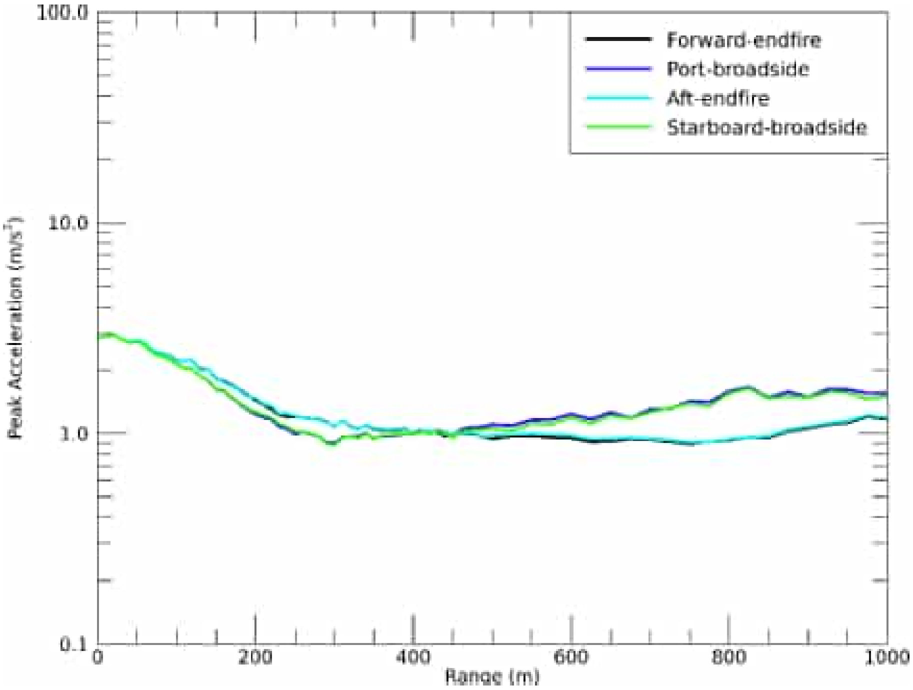


Figure 36. *Area 1, Site 4, triple 3480 in^3 seismic source at 1216 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

5.2.3.2. Area 3

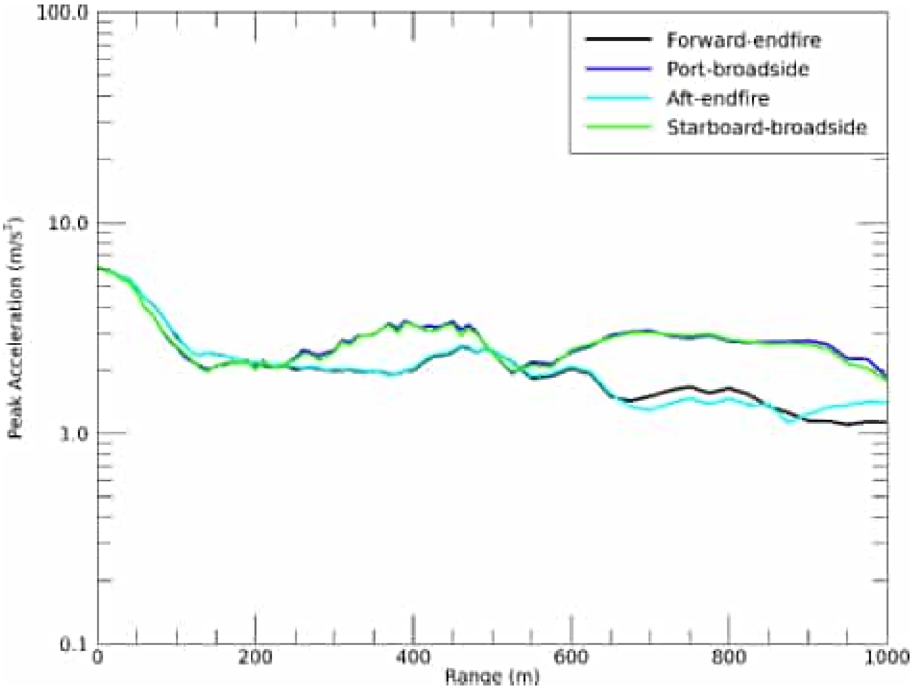


Figure 37. *Area 3, Site 1, triple 3480 in³ seismic source at 569 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

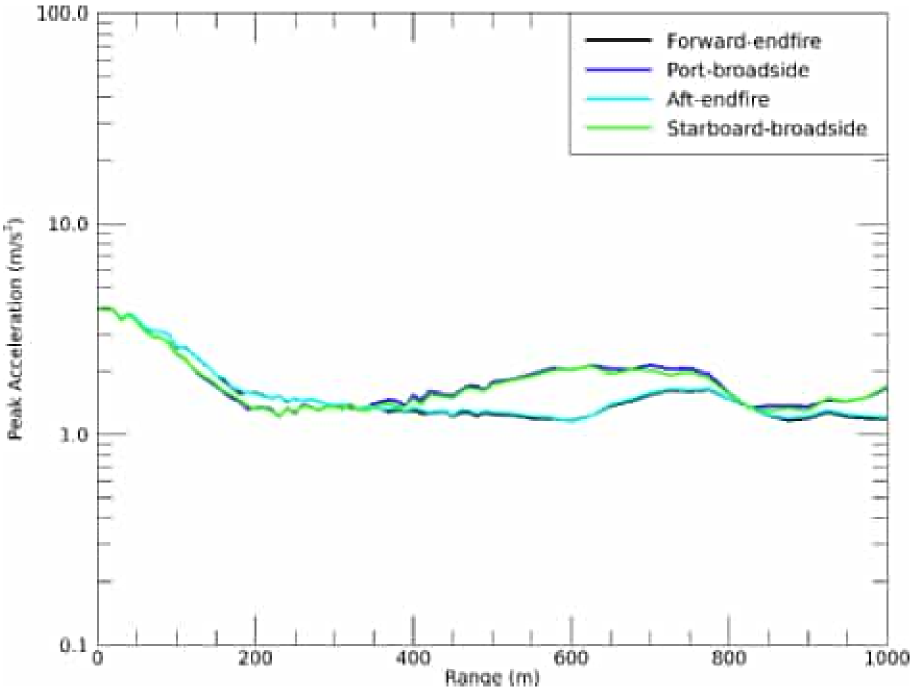


Figure 38. *Area 3, Site 2, triple 3480 in³ seismic source at 903 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

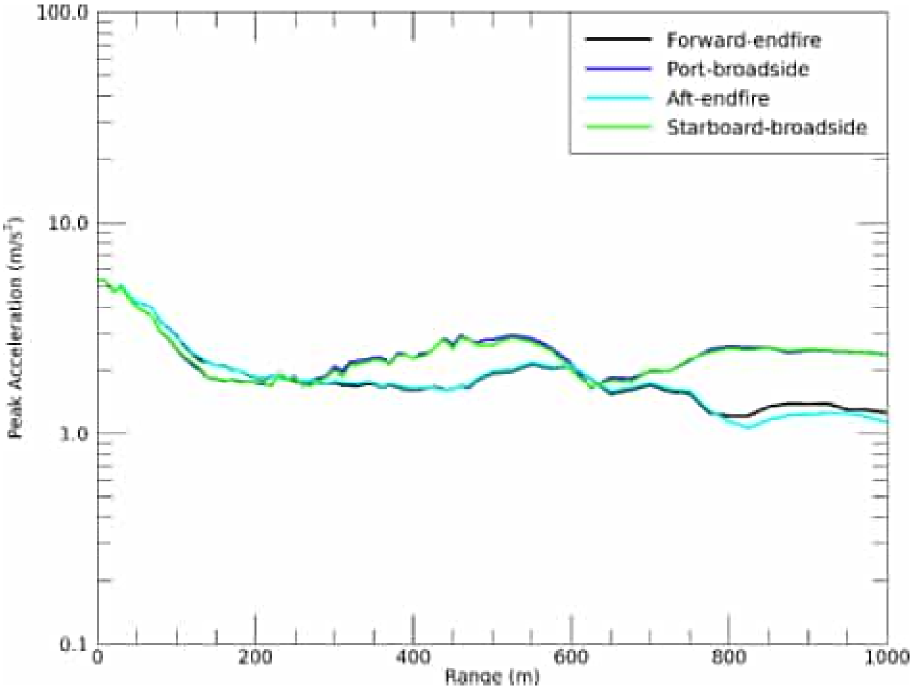


Figure 39. *Area 3, Site 4, triple 3480 in^3 seismic source at 674 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

5.2.3.3. Standalone Sites and 2D Tie-Line

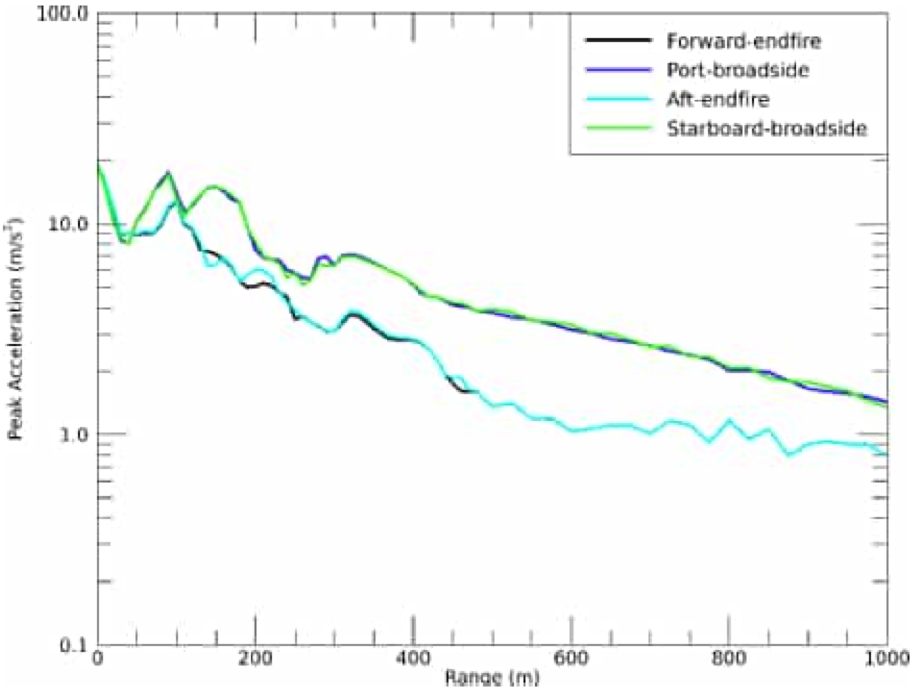


Figure 40. *Standalone Site 5, triple 3480 in^3 seismic source at 114 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

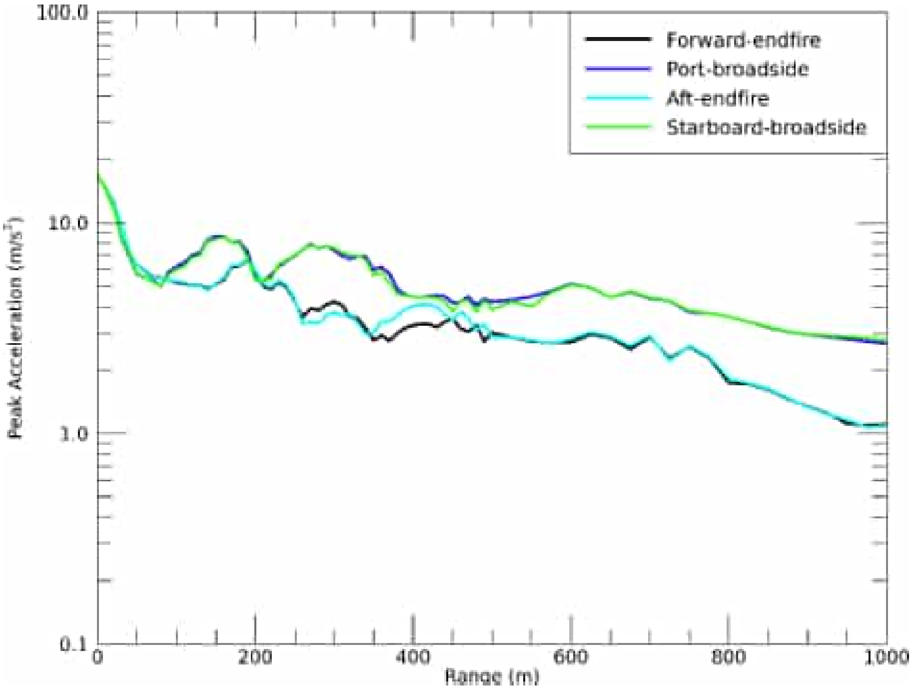


Figure 41. *2D Tie-Line, Site 1, triple 3480 in^3 seismic source at 220 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

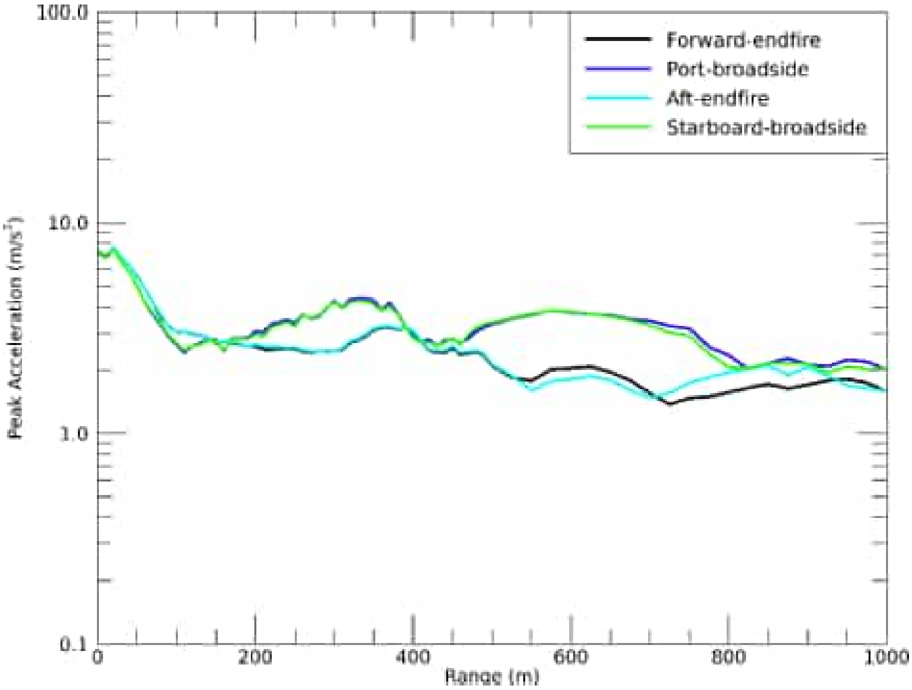


Figure 42. *2D Tie-Line, Site 2, triple 3480 in^3 seismic source at 450 m water depth*: Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of the seismic source along four directions.

5.2.4. SPL Receivers

Table 35 shows the received SPL level at the edge of the BIA closest to each modelling site. A range of points along the BIA was chosen and the maximum received SPL level was chosen.

Table 35. Received levels for cetaceans and pinnipeds at SPL receivers with locations shown in Table 6.

Receiver Location	Unweighted SPL (L_p; dB re 1 µPa)				LF-Weighted SPL (L_p; dB re 1 µPa)			
	Area 1	Area 2	Area 3	SA05	Area 1	Area 2	Area 3	SA05
Southern Right Whales – BIAs								
Migration and resting on migration – Victor Harbor to Portland	129.6	124.4	137.4	—	128.6	123.2	134.9	—
Aggregation - Breeding	143.8	137.3	118.7	124.0	141.5	135.3	117.8	121.7
Migration and resting on migration – East of Warrnambool to Philip Island area	135.0	121.2	—	111.2	132.9	118.8	—	110.3
Pygmy Blue Whales - BIAs								
Known foraging – Bonney Upwelling	—	—	162.8	—	—	—	159.1	—
Receiver Location	**Unweighted SPL (L_p; dB re 1 µPa)**				**OPW-Weighted SPL (L_p; dB re 1 µPa)**			
Australian sea lion - BIAs								
Foraging (males)	—	—	144.9	—	—	—	123.0	—

A dash indicates the receiver was not within the modelling bounds of any modelled site within the area.

5.3. Multiple Source Fields

5.3.1. Tabulated Results

Table 36. Maximum-over-depth distances (in km) to frequency-weighted 24 h sound exposure level (SEL24h) based permanent threshold shift (PTS) and temporary threshold shift (TTS) for marine mammals Southall et al. (2019) and sea turtles (Finneran et al. 2017) using the triple 3480 in^3 seismic source. Maximum extents are in the broadside direction.

Hearing group	Threshold for SEL$_{24h}$ ($L_{E,24h}$; dB re 1 µPa²·s)	Area 1		Area 2		Area 3	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS							
LF cetaceans	183	0.47	137	0.39	120	0.50	151
HF cetaceans	185	–	–	–	–	–	–
VHF cetaceans	155	0.11	3.88	0.10	4.52	0.10	4.59
Otariid seals	203	–	–	–	–	–	–

Hearing group	Threshold for SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	Area 1		Area 2		Area 3	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
Sea turtles	204	0.10	4.52	0.10	4.59	0.11	3.88
TTS							
LF cetaceans	168	149	13350	70.1	8373	156	18157
HF cetaceans	170	0.10	2.58	0.10	3.78	0.10	3.58
VHF cetaceans	140	0.85	229	0.44	139	0.29	99.0
Otariid Seals	188	0.10	3.78	0.10	3.48	0.10	2.34
Sea turtles	189	0.26	76.0	0.31	92.1	0.29	82.0

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Table 37. Scenario 1 – Distances to 24 h sound exposure level (SEL_{24h}) based fish criteria in the water column and at the seafloor for the triple 3480 in³ seismic source.

Marine fauna group	Threshold for SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	Maximum-over-depth		Seafloor	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
Mortality and potential mortal injury					
I	219	0.11	3.37	*	*
II, fish eggs and fish larvae	210	0.11	3.88	*	*
III	207	0.11	3.88	*	*
Fish recoverable injury					
I	216	0.11	3.88	*	*
II, III	203	0.11	7.33	*	*
Fish temporary threshold shift (TTS)					
I, II, III	186	4.80	1223	4.50	1160

Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.
An asterisk indicates that the threshold was not reached.

Table 38. Scenario 2 – Distances to 24 h sound exposure level (SEL_{24h}) based fish criteria in the water column and at the seafloor for the triple 3480 in³ seismic source.

Marine fauna group	Threshold for SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	Maximum-over-depth		Seafloor	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
Mortality and potential mortal injury					
I	219	0.10	4.52	*	*
II, fish eggs and fish larvae	210	0.10	4.52	*	*
III	207	0.10	4.52	*	*
Fish recoverable injury					
I	216	0.10	4.52	*	*
II, III	203	0.11	6.34	*	*
Fish temporary threshold shift (TTS)					
I, II, III	186	1.76	503	1.70	420

Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.
An asterisk indicates that the threshold was not reached.

Table 39. Scenario 3 – Distances to 24 h sound exposure level (SEL_{24h}) based fish criteria in the water column and at the seafloor for the triple 3480 in^3 seismic source.

Marine fauna group	Threshold for SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	Maximum-over-depth		Seafloor	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
Mortality and potential mortal injury					
I	219	0.10	4.18	*	*
II, fish eggs and fish larvae	210	0.10	4.59	*	*
III	207	0.10	4.59	*	*
Fish recoverable injury					
I	216	0.10	4.59	*	*
II, III	203	0.11	7.52	*	*
Fish temporary threshold shift (TTS)					
I, II, III	186	4.50	1161	4.50	1108

Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing. An asterisk indicates that the threshold was not reached.

5.3.2. Sound Level Contour Maps

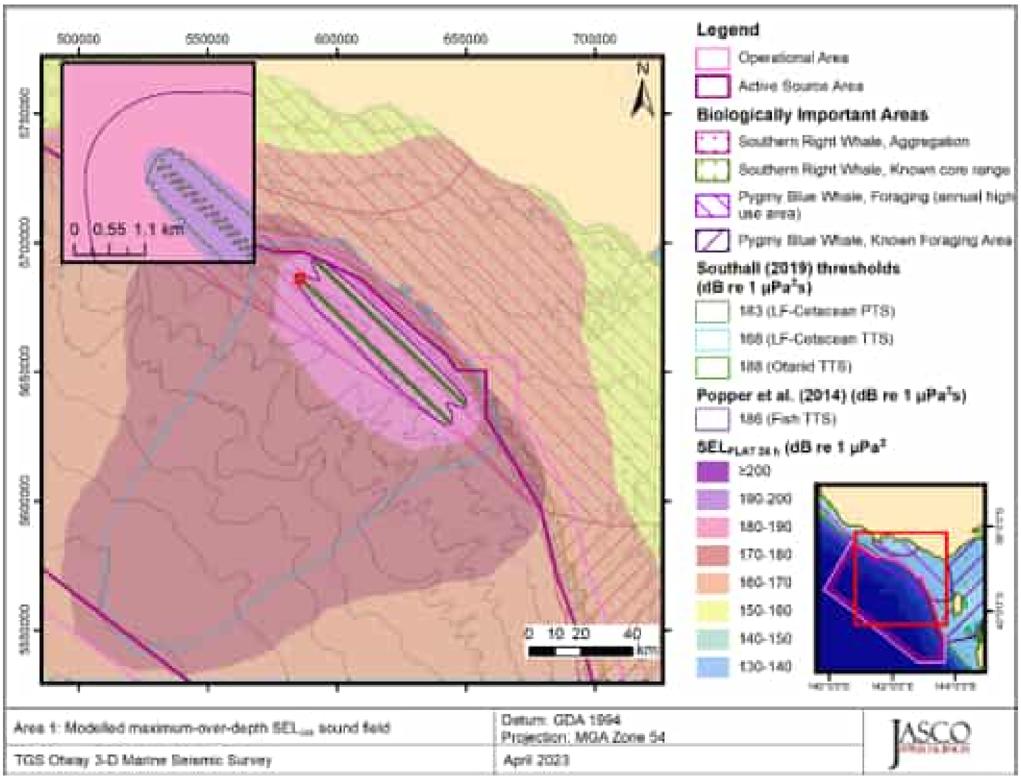


Figure 43. *Area 1*, *triple 3480 in^3 source*, Sound level contour map of unweighted maximum-over-depth SEL_{24h} results, along with isopleths for cetaceans and fish. Thresholds omitted here were not reached or not large enough to display graphically.

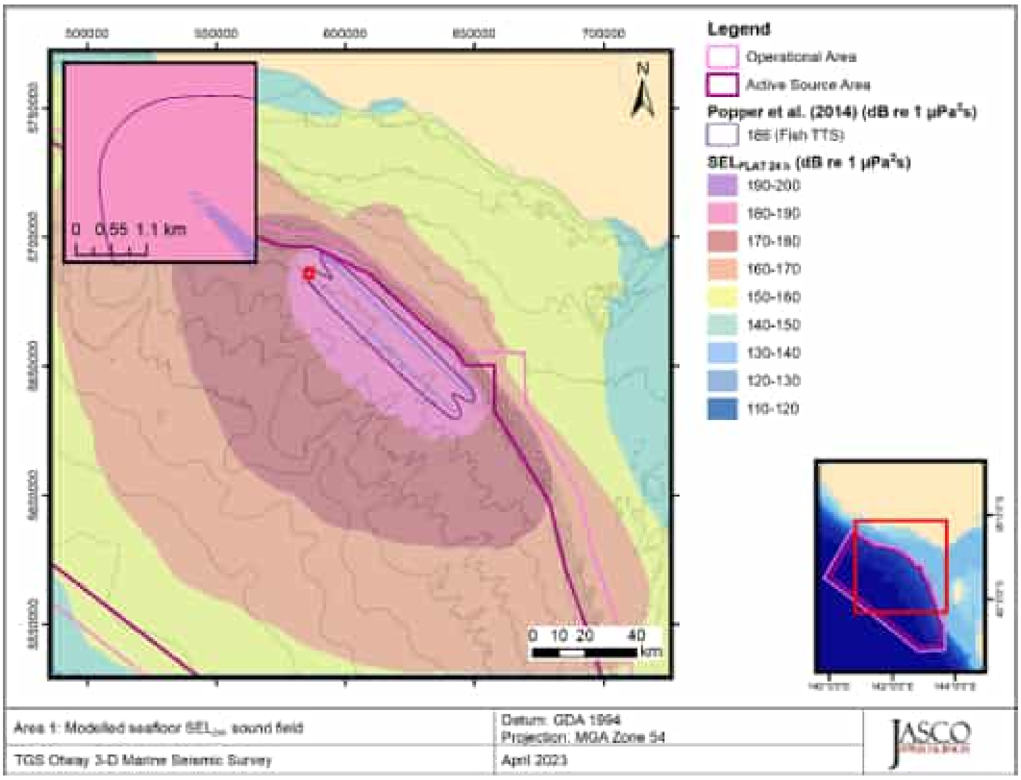


Figure 44. *Area 1*, *triple 3480 in³ source,* Sound level contour map of unweighted seafloor SEL_{24h} results along with the isopleth for fish temporary threshold shift (TTS).Thresholds omitted here were not reached or not large enough to display graphically.

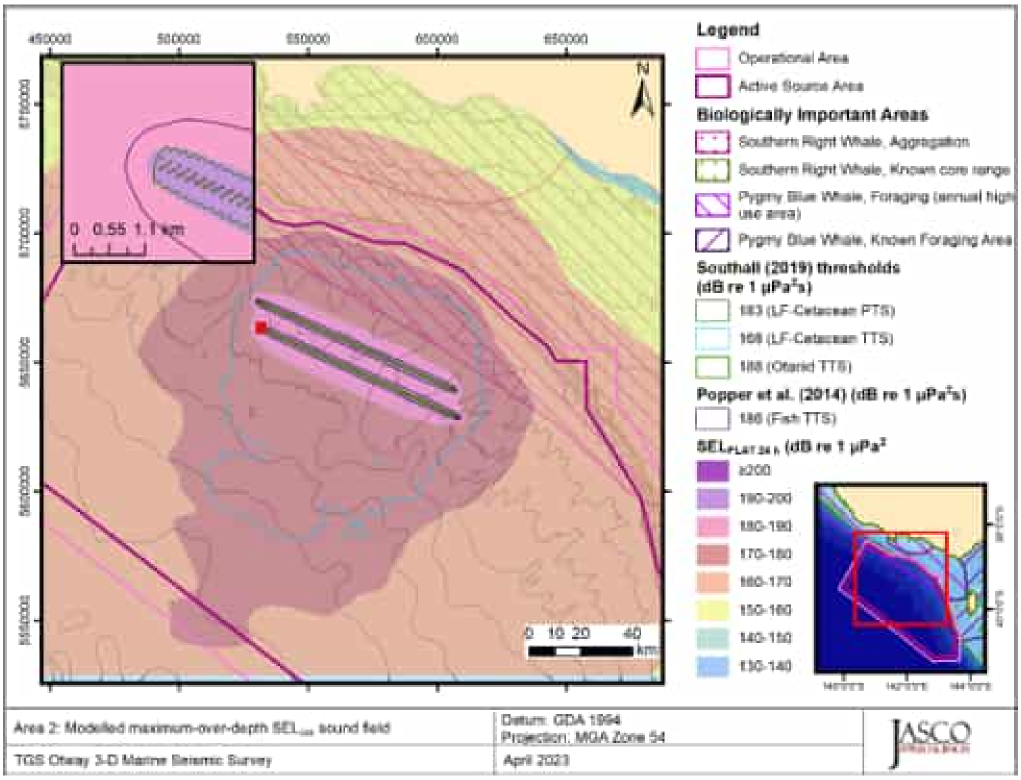


Figure 45. *Area 2*, *triple 3480 in³ source,* Sound level contour map of unweighted maximum-over-depth SEL_{24h} results, along with isopleths for cetaceans and fish. Thresholds omitted here were not reached or not large enough to display graphically.

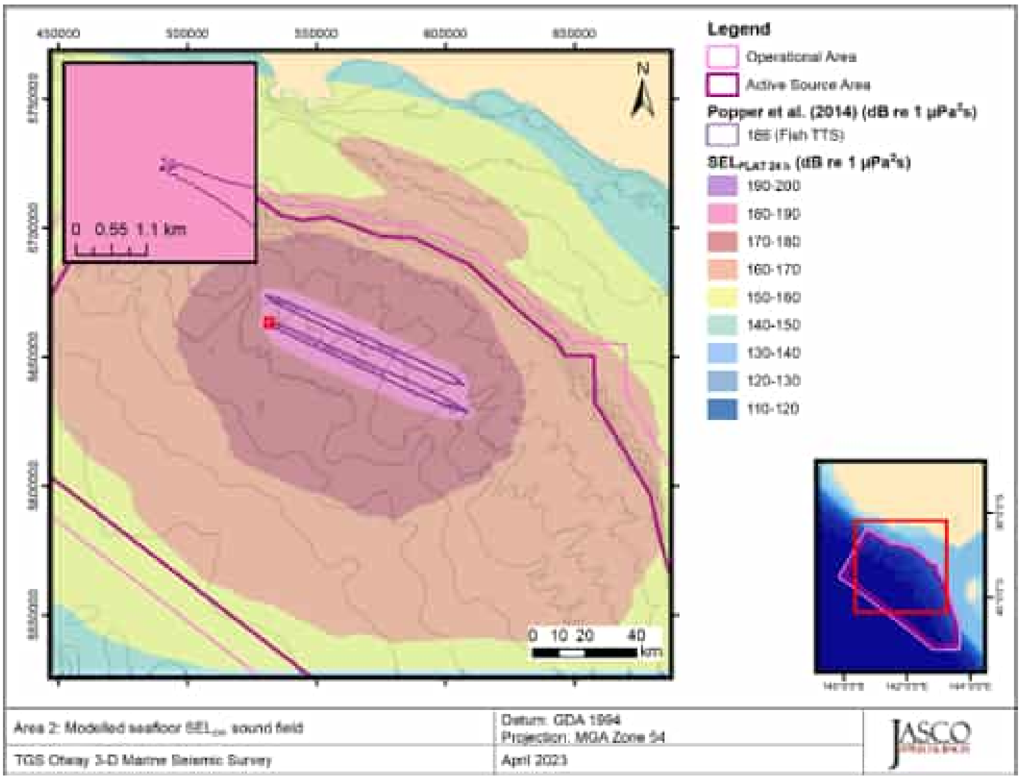


Figure 46. *Area 2*, *triple 3480 in³ source,* Sound level contour map of unweighted seafloor SEL_{24h} results along with the isopleth for fish temporary threshold shift (TTS).Thresholds omitted here were not reached or not large enough to display graphically.

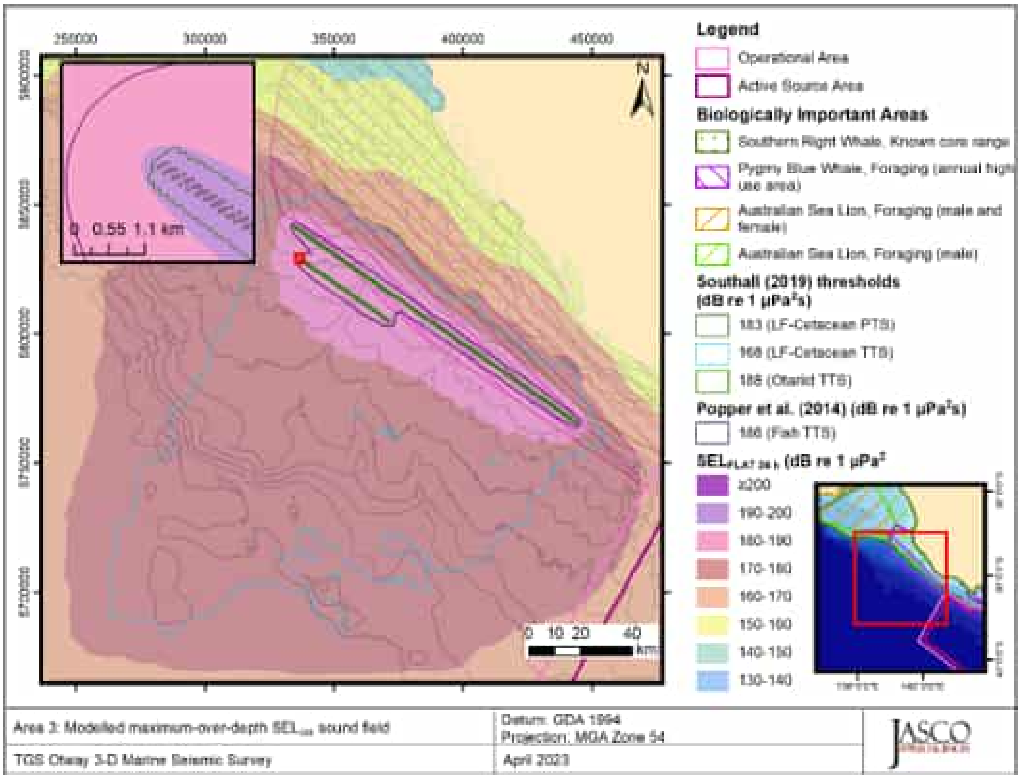


Figure 47. *Area 3*, *triple 3480 in³ source,* Sound level contour map of unweighted maximum-over-depth SEL_{24h} results, along with isopleths for cetaceans and fish. Thresholds omitted here were not reached or not large enough to display graphically.

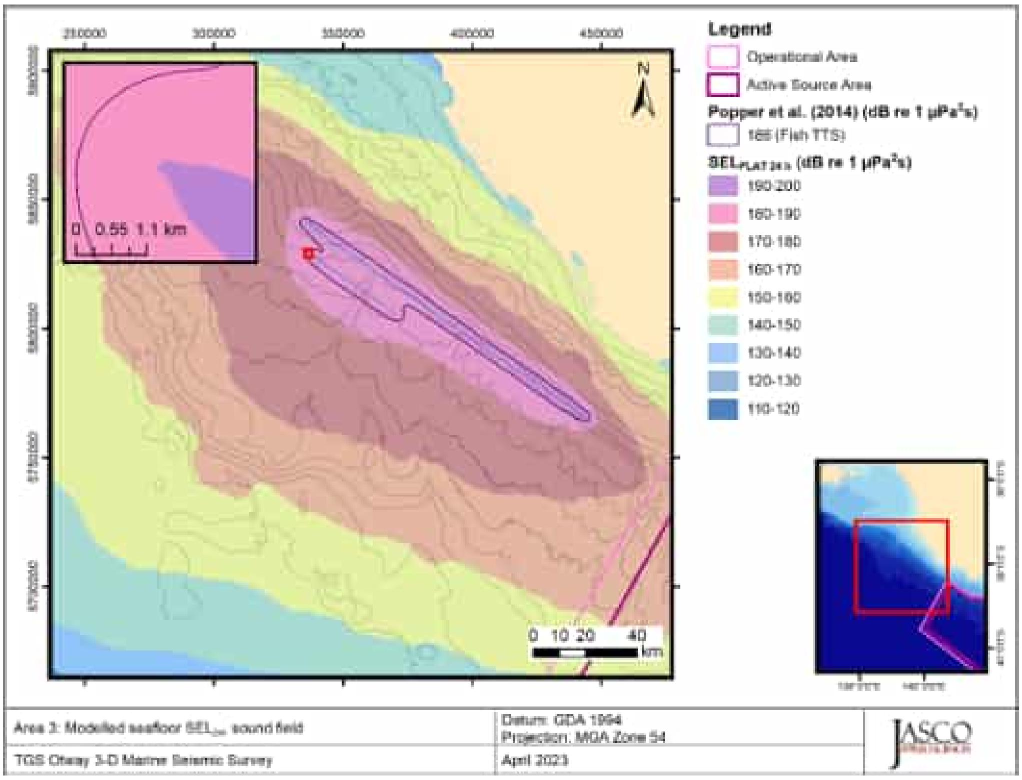


Figure 48. *Area* 3, *triple 3480 in³ source,* Sound level contour map of unweighted seafloor SEL_{24h} results along with the isopleth for fish temporary threshold shift (TTS).Thresholds omitted here were not reached or not large enough to display graphically.

5.4. Animal Movement Exposure Ranges

A summary of radial distances to exposure thresholds for pygmy blue whales and southern right whales, along with probability of exposure for each modelled scenario (Section 4.6.1) are included below. Table 40 shows results for Scenarios 1a and 1b for pygmy blue whales, whilst Table 41 shows results for Scenarios 2a and 2b for southern right whales. Results include $ER_{95\%}$ exposure ranges calculated for the 160 dB behavioural response threshold and SEL_{24h} thresholds for both TTS and PTS, and the probability of an animat being exposed above the threshold within the $ER_{95\%}$. Additionally, the 140 and 160 dB behavioural thresholds for weighted SPL results are also included for Scenarios 2a and 2b for southern right whale mother-calf pairs. Sections 5.4.1 and 5.4.2 include histograms of CPA ranges to SEL_{24h} PTS, TTS, and the behavioural response threshold for all scenarios with results in Tables 40 and 41. Exposure ranges for TTS and PTS PK thresholds were not included in the exposure analysis since acoustic modelling predicted no PTS PK exceedance and ranges of less than 100 m for TTS PK (see Table 16).

Table 40. Summary of animat simulation results for pygmy blue whales. The 95th percentile exposures ranges ($ER_{95\%}$) in km and probability of animats being exposed above threshold within the $ER_{95\%}$ (P_{exp} (%)) are provided. Dashes indicate no animats were exposed above threshold.

Threshold		Scenario 1a				Scenario 1b			
		Female		Male		Female		Male	
Description	Threshold level (dB)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)
PTS (SEL_{24h})[c]	183[a]	0.12	52	0.13	53	–	–	–	–
TTS (SEL_{24h})[c]	168[a]	31.7	46	27.9	50	15.4	32	15.3	33
Behavioural response (SPL)[d]	160[b]	6.05	83	6.21	80	7.01	41	6.82	51

[a] LF-weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)
[b] SPL (L_p; dB re 1 µPa)
[c] Southall et al. (2019) criteria for marine fauna.
[d] NOAA (2019) recommended unweighted behavioural threshold for marine mammals.

Table 41. Summary of animat simulation results for southern right whales. The 95th percentile exposures ranges ($ER_{95\%}$) in km and probability of animats being exposed above threshold within the $ER_{95\%}$ (P_{exp} (%)) are provided.

Threshold		Scenario 2a				Scenario 2b			
		Mother & Calf		No Calf		Mother & Calf		No Calf	
Description	Threshold level (dB)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)
PTS (SEL_{24h})[c]	183[a]	–	–	–	–	0.04	98	0.04	97
TTS (SEL_{24h})[c]	168[a]	–	–	8.51	33	10.8	61	11.0	67
Behavioural response (SPL)[d]	160[b]	–	–	–	–	6.10	73	6.06	76

[a] LF-weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s).
[b] SPL (L_p; dB re 1 µPa).
[c] Southall et al. (2019) criteria for marine fauna.
[d] NOAA (2019) recommended unweighted behavioural threshold for marine mammals.

Table 42. Animat simulation results for southern right whales for the 140 dB and 160 dB behavioural threshold for LF-weighted SPL results. The 95th percentile exposures ranges ($ER_{95\%}$) in km and probability of animats being exposed above threshold within the $ER_{95\%}$ (P_{exp} (%)) are provided.

Threshold		Mother & Calf			
		Scenario 2a		Scenario 2b	
Description	Threshold level (dB)	$ER_{95\%}$ (km)	P_{exp} (%)	$ER_{95\%}$ (km)	P_{exp} (%)
Behavioural response (SPL)[b]	160[a]	–	–	0.59	59
Behavioural response (SPL)[b]	140[a]	31.5	61	30.0	81

[a] LF-weighted SPL (L_p; dB re 1 µPa).
[b] Weighted behavioural threshold.

5.4.1. Exposure Range Histograms: Pygmy Blue Whales

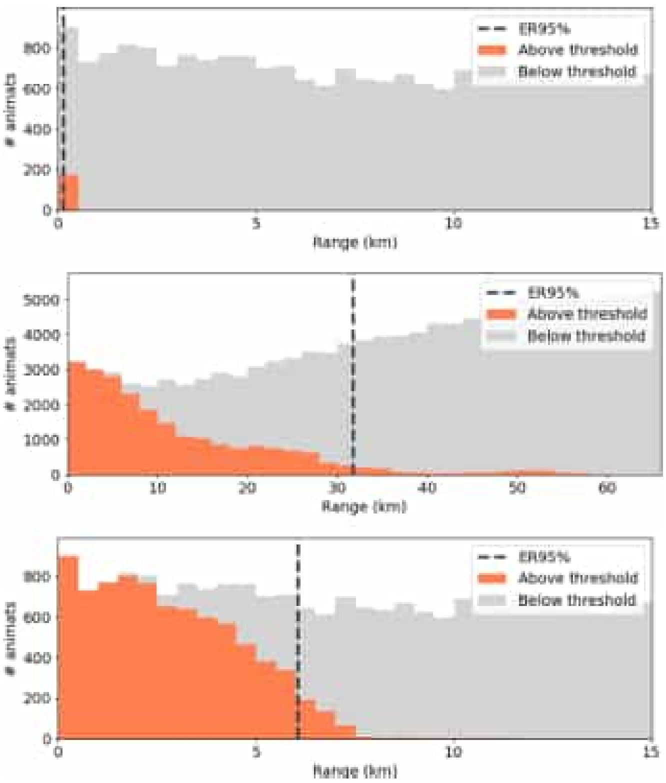


Figure 49. *Scenario 1a, female pygmy blue whales*: CPA range histogram for animats, SEL_{24h} PTS threshold (top panel), SEL_{24h} TTS threshold (middle panel, please note the adjusted maximum range on the x-axis), SPL behavioural threshold for unweighted SPL results (bottom panel). Bar colours indicate whether the animats exceeded the threshold.

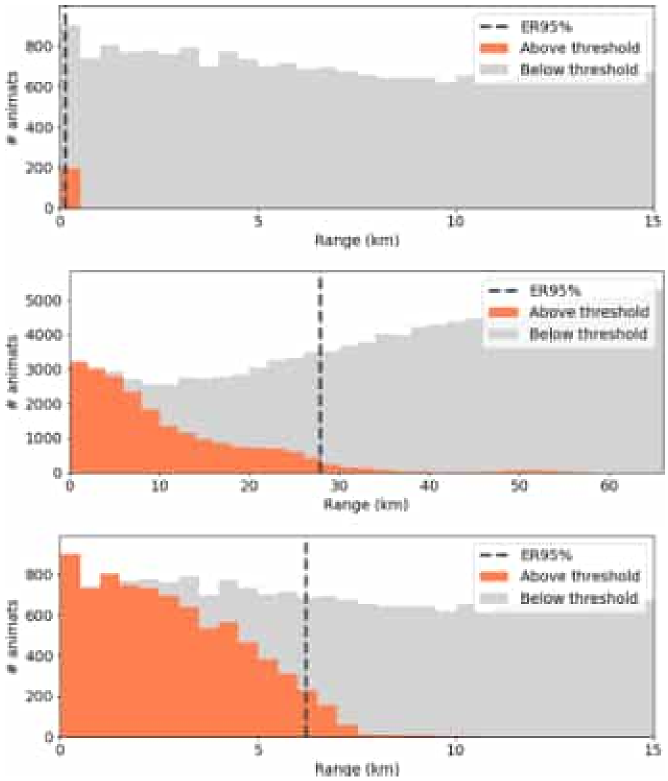


Figure 50. *Scenario 1a, male pygmy blue whales*: CPA range histogram for animats, SEL_{24h} PTS threshold (top panel), SEL_{24h} TTS threshold (middle panel, please note the adjusted maximum range on the x-axis), SPL behavioural threshold for unweighted SPL results (bottom panel). Bar colours indicate whether the animats exceeded the threshold.

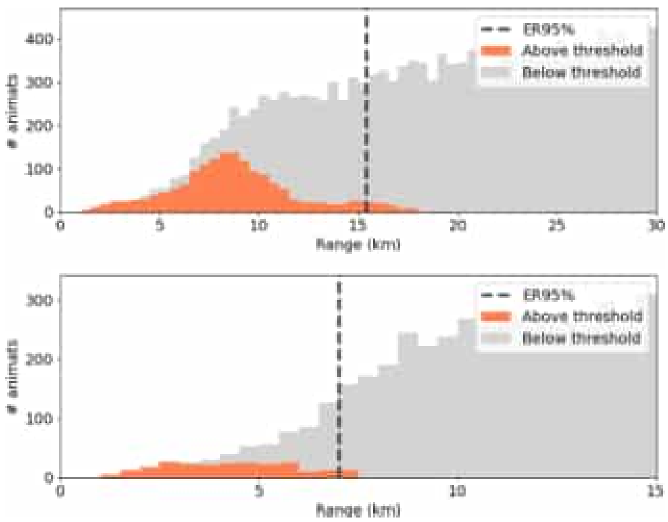


Figure 51. *Scenario 1b, female pygmy blue whales*: CPA range histogram for animats, SEL_{24h} TTS threshold (top panel), SPL behavioural threshold for unweighted SPL results (bottom panel, please note the adjusted maximum range on the x-axis). Bar colours indicate whether the animats exceeded the threshold.

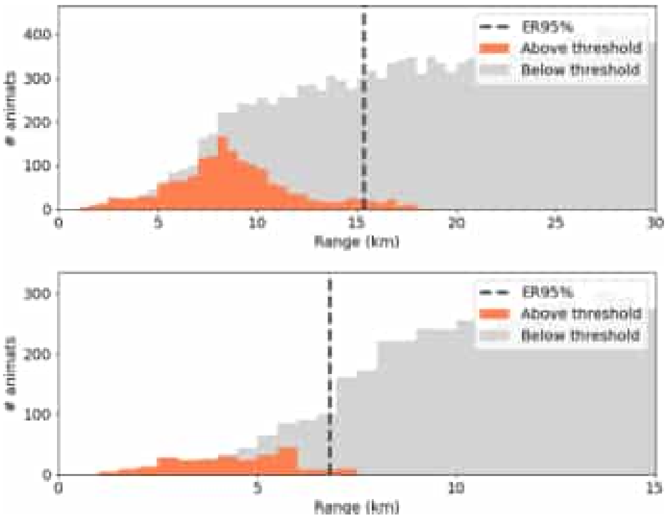


Figure 52. *Scenario 1b, male pygmy blue whales*: CPA range histogram for animats, SEL_{24h} TTS threshold (top panel,), SPL behavioural threshold for unweighted SPL results (bottom panel, please note the adjusted maximum range on the x-axis). Bar colours indicate whether the animats exceeded the threshold.

5.4.2. Exposure Range Histograms: Southern Right Whales

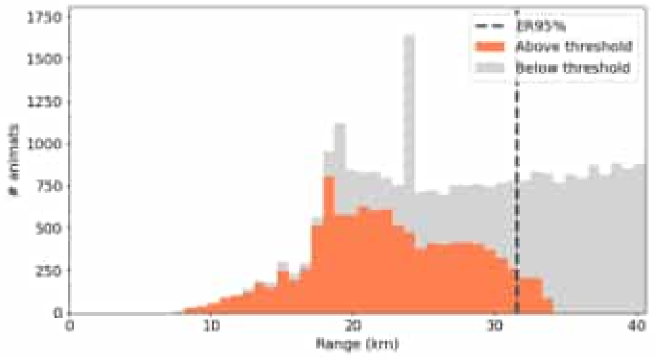


Figure 53. *Scenario 2a, southern right whales, mother & calf*: CPA range histogram for animats, 140 dB behavioural threshold for weighted SPL results Bar colours indicate whether the animats exceeded the threshold.

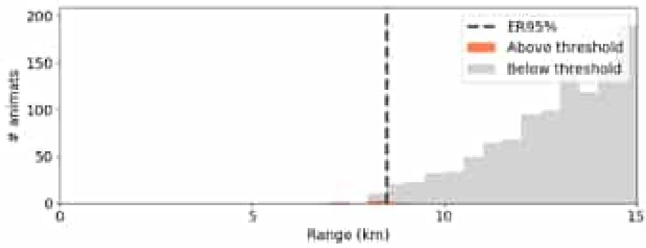


Figure 54. *Scenario 2a, southern right whales, no calf*: CPA range histogram for animats, SEL_{24h} TTS threshold. Bar colours indicate whether the animats exceeded the threshold.

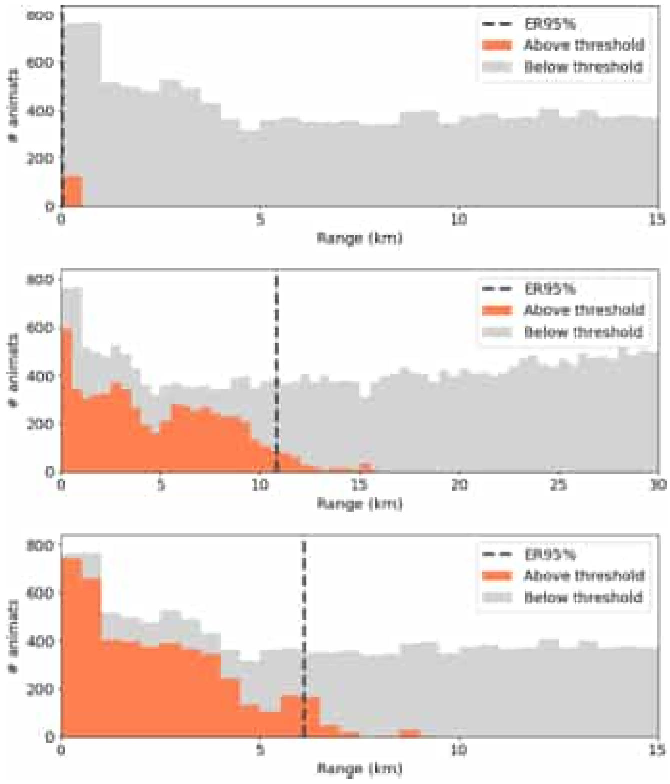


Figure 55. *Scenario 2b, southern right whales, mother & calf*: CPA range histogram for animats, SEL_{24h} PTS threshold (top panel), SEL_{24h} TTS threshold (middle panel, please note the adjusted maximum range on the x-axis), SPL behavioural threshold for unweighted SPL results (bottom panel). Bar colours indicate whether the animats exceeded the threshold.

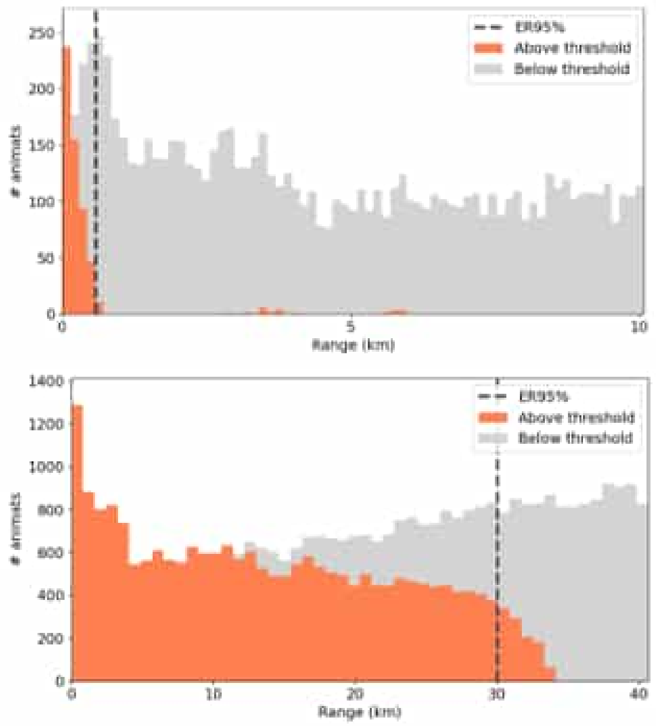


Figure 56. *Scenario 2b, southern right whales, mother & calf*: CPA range histogram for animats, 160 dB SPL behavioural threshold for weighted SPL results (top panel, please note the adjusted maximum range on the x-axis), 140 dB SPL behavioural threshold for weighted SPL results (bottom panel). Bar colours indicate whether the animats exceeded the threshold.

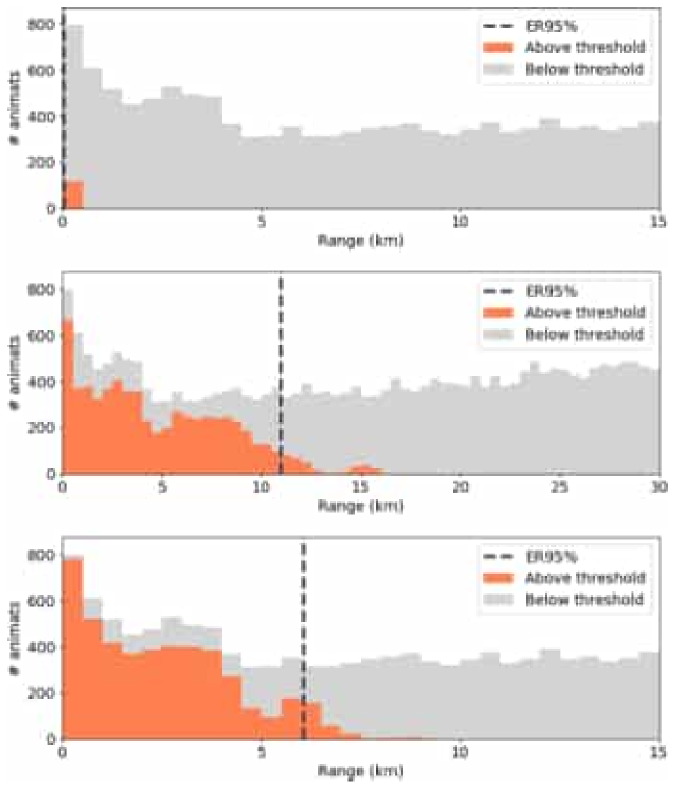


Figure 57. *Scenario 2b, southern right whales, no calf*: CPA range histogram for animats, SEL_{24h} PTS threshold (top panel), SEL_{24h} TTS threshold (middle panel, please note the adjusted maximum range on the x-axis), SPL behavioural threshold for unweighted SPL results (bottom panel). Bar colours indicate whether the animats exceeded the threshold.

6. Discussion and Conclusion

The modelling study predicted underwater sound levels associated with the planned TGS Otway 3-D MSS. The underwater sound field was modelled for a triple 3480 in^3 seismic source (see Appendix B.2). An analysis of seasonal sound speed profiles indicated that September was the month most conducive to sound propagation due to the presence of an upward refracting layer near the sea surface; as such it was selected to ensure a conservative estimation of distances to received sound level thresholds over the potential survey periods (see Appendix D.3.2). Modelling also accounted for site-specific bathymetric variations (see Appendix D.3.1) and local geoacoustic properties (see Appendix D.3.3).

Most acoustic energy from a seismic source is output at lower frequencies, in the tens to hundreds of hertz. The modelled array had a pronounced broadside directivity for decidecade bands between approximately 125 to 400 Hz (see Appendix B.3), which caused a noticeable axial bulge in the modelled acoustic footprints. The overall broadband (10–25000 Hz) unweighted per-pulse SEL and peak pressure source level of the seismic sources operating at 7 m depth are detailed in Table 12.

Since the original modelling was undertaken the Operational Area has been reduced with Assessment Area 3 now outside the Operational Area (as shown in Figure 1). Assessment Area 3 was characterized by sites with water depths between 569 and 1223 m, on the continental slope, with a geology of unconsolidated sediments which are increasingly consolidated with depth, and an seismic source orientation of 125/305°. Modelling results for Assessment Area 3 are still valid for locations within the Operational Area which have similar environmental parameters (see Appendix D.3 for detailed environmental parameters) and seismic source orientation (see Section 2).

6.1. Per-Pulse Sound Fields

The modelled sites encompassed water depths from 114 to 4252 m across three defined geological areas. At all single impulse sites, the distances to identified isopleths were greater in the broadside direction than the endfire direction. The array directionality and frequency content coupled with the bathymetry had a considerable effect on propagation at longer distances, with generally larger lobes of sound energy extending in the broadside direction, as shown in the sound footprint maps in Sections 5.2.2.1 to 5.2.2.4. Areas 1 and 3 are over a steep section of the continental slope which reflects sound energy offshore. Part of this sound energy combines with the direct path and is trapped in the deep sound channel which enables low-loss propagation driving the long ranges to impact thresholds offshore, away from the BIAs in the region.

The vertical slice plots (Section 5.2.2.5) assist in demonstrating the influence of the bathymetry, source location and sound speed profile on the sound field. Sources located in deeper water have a lower “cut-off frequency" (f_c) than sources in shallower water. The cut-off frequency is a single number that describes how much acoustic energy can propagate with minimal loss between then sea-surface and seafloor interfaces. For a given acoustic signal, frequencies below f_c are subject to higher loss compared to frequencies above the f_c since below this frequency sound energy is radiated directly into the seabed (Jensen et al. 2011). Deeper water has a lower f_c allowing more low-frequency energy to propagate when compared with shallower water on the continental shelf.

The sound speed profiles (Figures D-15 to D-17) were primarily downwards refracting apart from a small surface duct for all sites. The profiles had minimum sound speeds of approximately 1483 m/s where the sound channel axis begins to form. The shallow surface ducts (70–80 m deep) in the profiles shown in is not deep enough to trap energy below approximately 320–262 Hz (Equation 1.36 in Jensen et al. (2011)). The surface duct therefore can only trap the higher frequencies of the array effectively, which contribute less to the broadband source level than lower frequencies. However, when trapped, high frequencies can propagate with little loss and can produce higher levels near the sea-surface than scenarios where no surface duct is present.

The bathymetry varied greatly from north to south within the Operational Area, where the water depths increase as the continental shelf transitions into a deep-water environment. The combination of low-frequency content from the seismic source, the water depths within the survey area, and the downward refracting sound speed profile resulted in the sound field substantially interacting with the seabed for sites on or close to the continental shelf. The maximum-over-depth sound footprint maps and vertical slice plots (Section 5.2.2) assist in demonstrating the influence of the bathymetry and seabed composition on the sound field.

The distances to PK and PK-PK based criteria (Section 3.2 and 3.4) for fish, benthic crustaceans, and bivalves at the seafloor generally decreased with increasing water depth (Tables 17, 18, 26, 27 and 31 to 33). However, distances to these criteria did not always consistently change with increasing depth as any correlation between water depth and threshold distance is related to complex patterns of surface and seabed reflections that affect how sound propagates in shallow water. However, the number of modelled sites and water depths considered within the Operational Area provides a good representation of potential variability for seabed receptors.

Divers will primarily be inshore of the survey operations so the range to threshold was split into inshore, offshore, and longshore to estimate impacts more accurately for divers. The range to threshold was highly anisotropic with larger ranges extending offshore while sound travelling inshore was attenuated more.

6.2. Multiple Pulse Sound Fields

The accumulated SEL over 24 hours of seismic source operation was modelled considering three representative scenarios with realistic acquisition patterns. The modelling predicted the accumulation of sound energy, considering the change in location and the azimuth of the source at each pulse point, which was used to assess possible injury in marine mammals and the SEL_{24h} based fish and marine mammal criteria. The results were presented as maps of the accumulated exposure levels and tabulated values of ranges to threshold levels and exposure areas for the given effects criteria (Section 3).

The footprints and range maxima for all accumulated SEL thresholds are influenced by the seabed compositions along acquisition lines. The discussion above regarding ranges to isopleths also applies to the accumulated SEL calculations. The farthest ranges to thresholds for PTS and TTS were in the broadside direction, especially in the offshore direction, driven by the bathymetry and the sound speed profile.

6.3. Acoustic Results Summary

This section presents summary of the distances to the noise effect criteria applied in this study (Section 3) as relevant to the impact assessment. The effect criteria for impairment of marine mammals, fish and sea turtles use dual metrics (PK and SEL_{24h}), and the longest distance associated with either metric is required to be applied, and thus is presented in this summary.

The SEL_{24h} is a cumulative metric that reflects the dosimetric effect of noise levels within 24 h based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. Where the corresponding SEL_{24h} radii are larger than those for peak pressure criteria, they often represent an unlikely worst-case scenario. More realistically, marine mammals, fish and sea turtles would not stay in the same location for 24 hours, but rather a shorter period, depending upon their behaviour and the proximity and movements of the source. Therefore, a reported radius for SEL_{24h}

criteria does not mean that marine fauna travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either PTS or TTS) if it remained in that location for 24 h.

6.3.1. Area 1

Marine mammals

Table 43 summarises the distances to criteria for marine mammals, note that these distances are associated with the broadside aspect of the array.

Table 43. *Area 1*, maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for marine mammals (SPL levels from Table 14, PK values from Table 16, SEL_{24h} values from Table 36).

Hearing group	Modelled distance to effect threshold (R_{max})		
	Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
LF cetaceans	12.2	149	0.47
HF cetaceans		0.10	–
VHF cetaceans		0.85	0.11
Otariid seals		0.10	–

Noise exposure criteria: [1] NOAA (2019) and [2] Southall et al. (2019)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Sea turtles

Table 44 summarises the distances to criteria for sea turtles.

Table 44. *Area 1*, maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for sea turtles (SPL levels from Table 14, SEL_{24h} values from Table 36.

Hearing group	Modelled distance to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Sea turtles	4.18	0.81	0.26	0.10

Noise exposure criteria: [1] NSF (2011), [2] McCauley et al. (2000b), and [3] Finneran et al. (2017)

Fish, fish eggs, and fish larvae

This modelling study assessed the ranges at the seafloor and in the water column for quantitative criteria based on Popper et al. (2014) and considered both PK and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:

- Fish without a swim bladder (also appropriate for sharks in the absence of other information)
- Fish with a swim bladder that do not use it for hearing
- Fish that use their swim bladders for hearing
- Fish eggs and fish larvae

Table 45 summarises the distances to injury criteria for fish, fish eggs, and fish larvae along with the relevant metric and the location of the information within this report.

Table 45. *Area 1*, summary of maximum fish, fish eggs, and larvae injury and temporary threshold shift (TTS) onset distances for single impulse and 24 h sound level exposure (SEL_{24h}) modelled scenarios (PK values from Tables 16 and 17, SEL_{24h} values from Table 37).

Relevant hearing group	Effect criteria	Water column		Seafloor	
		Metric associated with longest distance to criteria	R_{max} (km)	Metric associated with longest distance to criteria	R_{max} (km)
Fish: No swim bladder	Recoverable injury	SEL_{24h}	0.11	*	*
	TTS	SEL_{24h}	4.80	SEL_{24h}	4.50
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing	Recoverable injury	PK	0.14	*	*
	TTS	SEL_{24h}	4.80	SEL_{24h}	4.50
Fish eggs, and larvae	Injury	PK	0.14	*	*

An asterisk indicates the threshold was not reached

Invertebrates, Sponges, Coral, and Plankton

To assist with assessing the potential effects on these receptors, the following were determined:

- Crustaceans: The sound level of 202 dB re 1 µPa PK-PK from Payne et al. (2008) was considered for seafloor sound levels; the sound level was reached at ranges between 358 and 437 m from the source (Table 18), depending on the modelled site.
- Bivalves: The distance where a particle acceleration of 37.57 ms^{-2} at the seafloor could occur was determined for comparing to results presented in Day et al. (2016a). This particle acceleration was not reached at the considered sites.
- Sponges and coral: the PK sound level at the seafloor directly underneath the seismic source was estimated at several modelled sites and compared to the sound level of 226 dB re 1 µPa PK for sponges and corals (Heyward et al. 2018); it was not reached for the considered sites (Table 17).

Divers

An SPL human health assessment of 145 dB re 1 µPa (SPL; L_P) derived from was considered for people swimming and diving and the sound level was reached at ranges between 19.3 and 30.2 km for the inshore direction depending on the modelled site.

6.3.2. Area 2

Marine mammals

Table 46 summarises the distances to criteria for marine mammals, note that these distances are associated with the broadside aspect of the array.

Table 46. *Area 2*, maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for marine mammals (SPL levels from Table 20, PK values from Table 21, SEL_{24h} values from Table 36).

Hearing group	Modelled distance to effect threshold (R_{max})		
	Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
LF cetaceans	6.61	70.1	0.39
HF cetaceans		0.10	–
VHF cetaceans		0.44	0.10
Otariid seals		0.10	–

Noise exposure criteria: [1] NOAA (2019) and [2] Southall et al. (2019)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Sea turtles

Table 47 summarises the distances to criteria for sea turtles.

Table 47. *Area 2*, maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for sea turtles (SPL levels from Table 20, PK values from Table 21, SEL_{24h} values from Table 36).

Hearing group	Modelled distance to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Sea turtles	2.26	0.79	0.31	0.10

Noise exposure criteria: [1] NSF (2011), [2] McCauley et al. (2000b), and [3] Finneran et al. (2017)

Fish, fish eggs, and fish larvae

This modelling study assessed the ranges at the seafloor and in the water column for quantitative criteria based on Popper et al. (2014) and considered both PK and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:

- Fish without a swim bladder (also appropriate for sharks in the absence of other information)
- Fish with a swim bladder that do not use it for hearing
- Fish that use their swim bladders for hearing
- Fish eggs and fish larvae

Table 48 summarises the distances to injury criteria for fish, fish eggs, and fish larvae along with the relevant metric and the location of the information within this report.

Table 48. *Area 2*, summary of maximum fish, fish eggs, and larvae injury and temporary threshold shift (TTS) onset distances for single impulse and 24 h sound level exposure (SEL_{24h}) modelled scenarios (PK values from Tables 25 and 26, SEL_{24h} values from Table 38).

Relevant hearing group	Effect criteria	Water column: Metric associated with longest distance to criteria	Water column: R_{max} (km)	Seafloor: Metric associated with longest distance to criteria	Seafloor: R_{max} (km)
Fish: No swim bladder	Recoverable injury	SEL_{24h}	0.10	*	*
	TTS	SEL_{24h}	1.76	SEL_{24h}	1.70
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing	Recoverable injury	PK	0.14	*	*
	TTS	SEL_{24h}	1.76	SEL_{24h}	1.70
Fish eggs, and larvae	Injury	PK	0.14	*	*

An asterisk indicates the threshold was not reached.

6.3.3. Area 3

Marine mammals

Table 49 summarises the distances to criteria for marine mammals, note that these distances are associated with the broadside aspect of the array.

Table 49. *Area 3*, maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for marine mammals (SPL levels from Table 23, PK values from Table 25, SEL_{24h} values from Table 36).

Hearing group	Modelled distance to effect threshold (R_{max}): Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
LF cetaceans	9.33	156	0.50
HF cetaceans		0.10	–
VHF cetaceans		0.29	0.10
Otariid seals		0.10	–

Noise exposure criteria: [1] NOAA (2019) and [2] Southall et al. (2019)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Sea turtles

Table 50 summarises the distances to criteria for sea turtles.

Table 50. *Area 3*, Maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and temporary threshold shift (TTS) and permanent threshold shift (PTS) for sea turtles (SPL levels from Table 23, SEL_{24h} values from Table 36.

Hearing group	Modelled distance to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Sea turtles	4.15	1.37	0.29	0.11

Noise exposure criteria: [1] NSF (2011), [2] McCauley et al. (2000b), and [3] Finneran et al. (2017)

Fish, fish eggs, and fish larvae

This modelling study assessed the ranges at the seafloor and in the water column for quantitative criteria based on Popper et al. (2014) and considered both PK and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:

- Fish without a swim bladder (also appropriate for sharks in the absence of other information)
- Fish with a swim bladder that do not use it for hearing
- Fish that use their swim bladders for hearing
- Fish eggs and fish larvae

Table 51 summarises the distances to injury criteria for fish, fish eggs, and fish larvae along with the relevant metric and the location of the information within this report.

Table 51. *Area 3*, summary of maximum fish, fish eggs, and larvae injury and temporary threshold shift (TTS) onset distances for single impulse and 24 h sound level exposure (SEL_{24h}) modelled scenarios (PK values from Tables 25 and 26, SEL_{24h} values from Table 39).

Relevant hearing group	Effect criteria	Water column		Seafloor	
		Metric associated with longest distance to criteria	R_{max} (km)	Metric associated with longest distance to criteria	R_{max} (km)
Fish: No swim bladder	Recoverable injury	SEL_{24h}	0.10	*	*
	TTS	SEL_{24h}	4.50	SEL_{24h}	4.50
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing	Recoverable injury	PK	0.14	*	*
	TTS	SEL_{24h}	4.50	SEL_{24h}	4.50
Fish eggs, and larvae	Injury	PK	0.14	*	*

An asterisk indicates that the threshold was not reached.

Invertebrates, Sponges, Coral, and Plankton

To assist with assessing the potential effects on these receptors, the following were determined:

- Crustaceans: The sound level of 202 dB re 1 µPa PK-PK from Payne et al. (2008) was considered for seafloor sound levels; the sound level was reached at a range of between 433 and 512 m from the source (Table 27) depending on the modelled site.

- Bivalves: The distance where a particle acceleration of 37.57 ms^{-2} at the seafloor could occur was determined for comparing to results presented in Day et al. (2016a). This particle acceleration was not reached at the considered sites.
- Sponges and coral: the PK sound level at the seafloor directly underneath the seismic source was estimated at several modelled sites and compared to the sound level of 226 dB re 1 µPa PK for sponges and corals (Heyward et al. 2018); it was not reached for the considered modelled sites (Table 26).

Divers

An SPL human health assessment of 145 dB re 1 µPa (SPL; L_P) derived from was considered for people swimming and diving and the sound level was reached at ranges between 12.5 and 27.3 km for the inshore direction depending on the modelled site.

6.3.4. Standalone Sites and 2D Tie-Line

For Standalone Sites 1-4, the results in Section 5.2.1.4 should be referred to, and for PTS and TTS ranges the closest applicable SEL_{24h} scenario should be referred to. Results for invertebrates at Standalone Site 5 and 2D Tie-Line Sites 1 and 2 were determined as follows:

- Crustaceans: The sound level of 202 dB re 1 µPa PK-PK from Payne et al. (2008) was considered for seafloor sound levels; the sound level was reached at a range of between 385 and 676 m from the source (Tables 32 and 33) depending on the modelled site.

6.4. Animal Movement Modelling

The estimated sound fields produced by source and propagation models for the planned TGS Otway Basin 3-D MSS were incorporated into a sound exposure model for pygmy blue whales and southern right whales to estimate the radial distance within which 95% of the exposure exceedances occur ($ER_{95\%}$), along with the probability that an animat with the closest point of approach within that distance would be exposed above the relevant threshold (P_{exp}).

For the exposure analysis, restricted seeding and unrestricted seeding were considered for pygmy blue whales as well as restricted seeding for migrating southern right whales (Section 4.6.1).

Of the four scenarios considered, only the seeding areas of Scenarios 1a and 2b had partial overlap with the Active Source Area of the seismic survey. The closest distance between the survey lines and the known core range area for southern right whales and the adjusted foraging pygmy blue whale BIA is 6.2 km and 1.1.km, respectively (Figure 5).

Sections 6.4.1 and 6.4.2 summarise the PTS, TTS, and behavioural exposure range results, with the tabulated results presented in Tables 40 and 41.

6.4.1. PTS and TTS

Exposure ranges from animal movement modelling for PTS and TTS criteria are typically shorter than those predicted using acoustic propagation modelling because of the shorter dwell time of the moving animats. In all scenarios, for both restricted and unrestricted cases, PTS and TTS exposure ranges were substantially shorter than acoustic ranges to threshold.

Both migrating southern right whale restricted seeding scenarios resulted in exposures above threshold, and therefore exposure ranges. The maximum $ER_{95\%}$ for SEL_{24h} thresholds was 11.0 km for

TTS and 0.04 km for PTS. The restricted seeding of foraging pygmy blue whales resulted in TTS and PTS exposures above threshold. The maximum $ER_{95\%}$ for SEL_{24h} thresholds of this scenario was 15.4 km for TTS. Unrestricted seeding of foraging pygmy blue whales caused exposures above threshold with much higher exposure ranges. The maximum $ER_{95\%}$ for SEL_{24h} thresholds was 31.7 km for TTS and 0.13 km for PTS. Exposure ranges are, on average, slightly longer for TTS and PTS for unrestricted vs restricted scenarios because unrestricted animats have more opportunities to be seeded in deeper water, where acoustic ranges will be longer.

The probability of exposure within $ER_{95\%}$ varied between 33 and 98% for migrating southern right whales restricted scenarios and 32-52% for foraging pygmy blue whales scenarios, indicating that some, but not all, animats exposed within the 95th percentile range were exposed above threshold. This is because animats can move in and out of the modelling range as well as their vertical position in the water column, thus potentially limiting the length of time they are within the exposure radius. For example, an animat might approach within the predicted exposure range but if they are traveling more quickly on average than other animats, they may not accumulate as much exposure, or they may be spending more time at depths with quieter sound levels.

6.4.2. Behavioural Effects

Exposure ranges ($ER_{95\%}$) for single exposure metrics, such as the SPL behavioural response criteria, are typically comparable to the predicted acoustic ranges. Acoustic ranges are conservatively calculated using the maximum-over-depth sound fields and assuming static receivers, while exposure ranges account for animats sampling the sound field vertically and horizontally based on species-specific diving parameters, so exposure ranges are generally slightly lower than the R_{max} acoustic ranges. The behavioural effects considering the unweighted SPL results are consistent with this pattern. For foraging pygmy blue whale scenarios, behavioural exposure ranges for unweighted SPL results were similar, at maximum 6.21 km and 7.01 km for the unrestricted and restricted seeding, respectively, with the probabilities of exposure being at maximum 83% and 51%. Migrating southern right whales seeded in their known core range area resulted in no exposures above the SPL behavioural response criteria. However, when the seeding area was adjusted to include the survey lines (see Figure 5), behavioural exposure ranges for the unweighted SPL results were to up to 6.10 km with the probability of exposure of up to 73%. This occurs because this seeding area overlaps with the survey lines and hence, this seeding allows more animats to get closer to source locations, thereby shifting the bulk of the distribution lower (e.g., Figures 55 and 57). The closest distance between the survey lines and the southern right whale known core range area is 6.2 km, which explains why there are no exposures above the SPL behavioural response criteria for southern right whales seeded in the known core range area.

In addition to the exposure ranges ($ER_{95\%}$) to the SPL behavioural response criteria for the unweighted SPL results, the 140 and 160 dB behavioural thresholds for weighted SPL results were also included for Scenarios 2a and 2b for southern right whale mother-calf pairs. The behavioural exposure ranges to the 140 and 160 dB threshold were up to 31.5 km and 0.59 km, respectively, with the probability of exposure of up to 61 and 59%.

Exposure ranges to the 160 dB behavioural threshold were significantly lower for the weighted SPL than the unweighted SPL results, as expected based on the vertical distribution of the sound field (see Figure 58). As shown in Figure 2, Area 2 is situated on the shelf edge, with a downslope propagation resulting in energy becoming trapped in the deep sound channel. Because of this, the maximum-over-depth threshold isopleths extent to larger ranges in the offshore (southwest) direction. Migrating southern right whale mother-calf pairs are expected to spend most of their time in a behavioural mode where most dives reach less than 30 m in depth. Figure 58 shows a vertical sound field slice beginning at the source location and extending towards the shallower water at an azimuth of 45°, while Figure 59 shows contour plots with weighted SPL isopleths based on the full water column and the upper 30 m only. The plots show how migrating southern right whale mother-calf pairs sample the upper portion of the water column, which is quieter for weighted SPL results, and results in exposure ranges that are shorter than exposure ranges for unweighted SPL results.

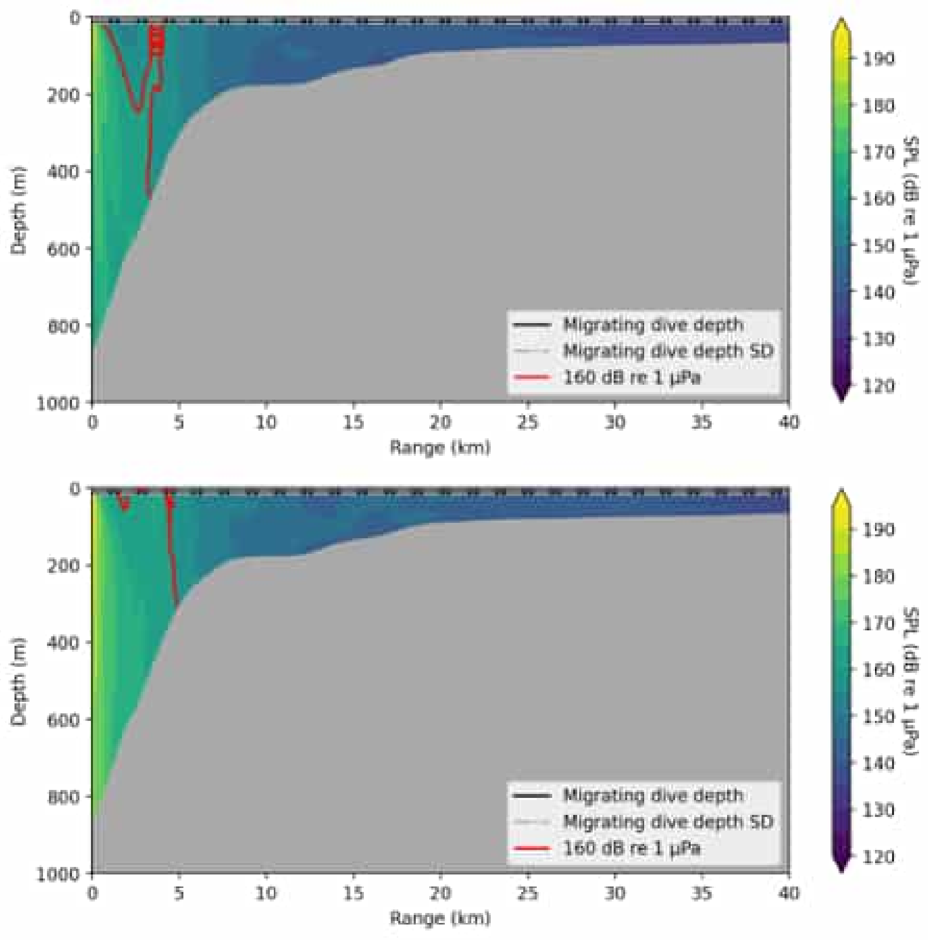


Figure 58. *Site 1:* Example SPL vertical slice from the seismic source to 40 km at an azimuth of 45° towards inshore, for the weighted (top) and unweighted (bottom) SPL. The 160 dB behavioural response threshold is highlighted in red, and the migrating southern right whale mother-calf pairs dive depth is indicated by horizontal lines.

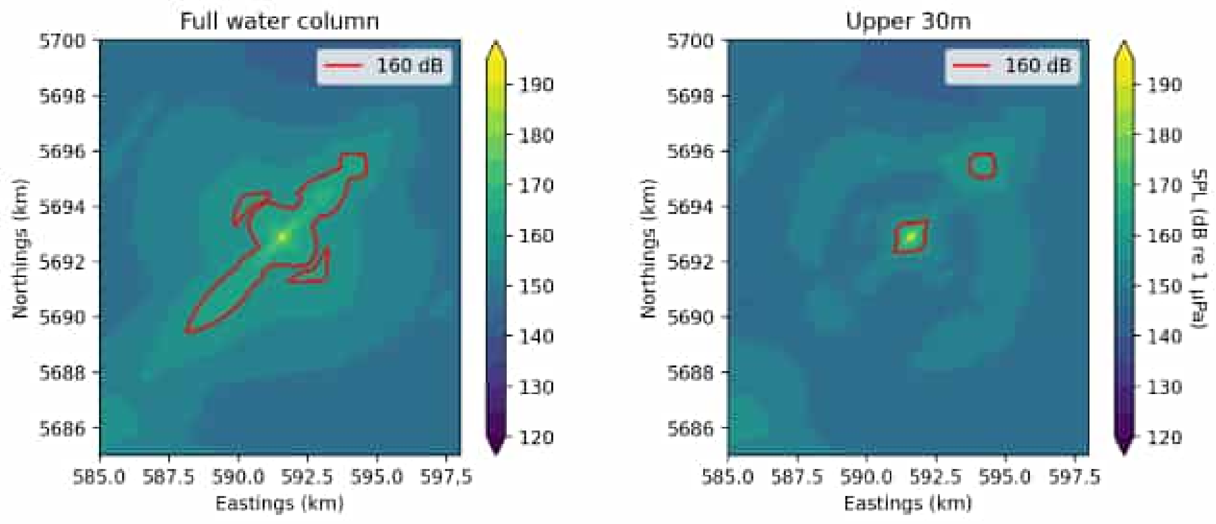


Figure 59. *Site 1:* Weighted SPL isopleth contour maps for the full water column (left) and the upper 30 m (right), highlighting the 160 dB behavioural response threshold.

Glossary

Unless otherwise stated in an entry, these definitions are consistent with ISO 80000-3 (2017).

1/3-octave

One third of an octave. *Note*: A one-third octave is approximately equal to one decidecade (1/3 oct ≈ 1.003 ddec).

1/3-octave-band

Frequency band whose bandwidth is one one-third octave. *Note*: The bandwidth of a one-third octave-band increases with increasing centre frequency.

A-weighting

Frequency-selective weighting for human hearing in air that is derived from the inverse of the idealized 40-phon equal loudness hearing function across frequencies.

absorption

The reduction of acoustic pressure amplitude due to acoustic particle motion energy converting to heat in the propagation medium.

attenuation

The gradual loss of acoustic energy from absorption and scattering as sound propagates through a medium.

auditory frequency weighting

The process of applying an auditory frequency weighting function. In human audiometry, C-weighting is the most commonly used function, an example for marine mammals are the auditory frequency weighting functions published by Southall et al. (2007).

auditory frequency weighting function

Frequency weighting function describing a compensatory approach accounting for a species' (or functional hearing group's) frequency-specific hearing sensitivity. Example hearing groups are low-, high-, and very-high-frequency cetaceans, phocid and otariid pinnipeds.

azimuth

A horizontal angle relative to a reference direction, which is often magnetic north or the direction of travel. In navigation it is also called bearing.

bandwidth

The range of frequencies over which a sound occurs. Broadband refers to a source that produces sound over a broad range of frequencies (e.g., seismic airguns, vessels) whereas narrowband sources produce sounds over a narrow frequency range (e.g., sonar) (ANSI S1.13-2005 (R2010)).

bar

Unit of pressure equal to 100 kPa, which is approximately equal to the atmospheric pressure on Earth at sea level. 1 bar is equal to 10^5 Pa or 10^{11} µPa.

boxcar averaging

A signal smoothing technique that returns the averages of consecutive segments of a specified width.

broadband level

The total level measured over a specified frequency range.

broadside direction

Perpendicular to the travel direction of a source. Compare with endfire direction.

cetacean

Any animal in the order Cetacea. These are aquatic species and include whales, dolphins, and porpoises.

compressional wave

A mechanical vibration wave in which the direction of particle motion is parallel to the direction of propagation. Also called primary wave or P-wave.

conductivity-temperature-depth (CTD)

Measurement data of the ocean’s conductivity, temperature, and depth; used to compute sound speed and salinity.

decade

Logarithmic frequency interval whose upper bound is ten times larger than its lower bound (ISO 80000-3:2006).

decidecade

One tenth of a decade. *Note*: An alternative name for decidecade (symbol ddec) is “one-tenth decade”. A decidecade is approximately equal to one third of an octave (1 ddec ≈ 0.3322 oct) and for this reason is sometimes referred to as a “one-third octave”.

decidecade band

Frequency band whose bandwidth is one decidecade. *Note*: The bandwidth of a decidecade band increases with increasing centre frequency.

decibel (dB)

Unit of level used to express the ratio of one value of a power quantity to another on a logarithmic scale. Unit: dB.

delphinid

Family of oceanic dolphins, or Delphinidae, composed of approximately thirty extant species, including dolphins, porpoises, and killer whales.

duty cycle

The time when sound is periodically recorded by an acoustic recording system.

endfire direction

Parallel to the travel direction of a source. Also see **broadside direction**.

energy source level

A property of a sound source obtained by adding to the sound exposure level measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 $\mu Pa^2 m^2 s$.

energy spectral density source level

A property of a sound source obtained by adding to the energy spectral density level of the sound pressure measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 $\mu Pa^2 m^2 s/Hz$.

ensonified

Exposed to sound.

far field

The zone where, to an observer, sound originating from an array of sources (or a spatially distributed source) appears to radiate from a single point.

Fourier transform (or Fourier synthesis)

A mathematical technique which, although it has varied applications, is referenced in the context of this report as a method used in the process of deriving a spectrum estimate from time-series data (or the reverse process, termed the inverse Fourier transform). A computationally efficient numerical algorithm for computing the Fourier transform is known as fast Fourier transform (FFT).

flat weighting

Term indicating that no frequency weighting function is applied. Synonymous with unweighted.

frequency

The rate of oscillation of a periodic function measured in cycles-per-unit-time. The reciprocal of the period. Unit: hertz (Hz). Symbol: f. 1 Hz is equal to 1 cycle per second.

frequency weighting

The process of applying a frequency weighting function.

frequency-weighting function

The squared magnitude of the sound pressure transfer function. For sound of a given frequency, the frequency weighting function is the ratio of output power to input power of a specified filter, sometimes expressed in decibels. Examples include the following:

- *Auditory frequency weighting function*: compensatory frequency weighting function accounting for a species' (or functional hearing group's) frequency-specific hearing sensitivity.
- *System frequency weighting function*: frequency weighting function describing the sensitivity of an acoustic acquisition system, typically consisting of a hydrophone, one or more amplifiers, and an analogue to digital converter.

geoacoustic

Relating to the acoustic properties of the seabed.

hearing group

Category of animal species when classified according to their hearing sensitivity and to the susceptibility to sound. Examples for marine mammals include very low-frequency (VLF) cetaceans, low-frequency (LF) cetaceans, mid-frequency (MF) cetaceans, high-frequency (HF) cetaceans, very high-frequency (VHF) cetaceans, otariid pinnipeds in water (OPW), phocid pinnipeds in water (PPW), sirenians (SI), other marine carnivores in air (OCA), and other marine carnivores in water (OCW) (NMFS 2018, Southall et al. 2019). See **auditory frequency weighting functions**, which are often applied to these groups. Examples for fish include species for which the swim bladder is involved in hearing, species for which the swim bladder is not involved in hearing, and species without a swim bladder (Popper et al. 2014).

hearing threshold

The sound pressure level for any frequency of the hearing group that is barely audible for a given individual for specified background noise during a specific percentage of experimental trials.

hertz (Hz)

A unit of frequency defined as one cycle per second.

high-frequency (HF) cetacean

See **hearing group**.

impulsive sound

Qualitative term meaning sounds that are typically transient, brief (less than 1 second), broadband, with rapid rise time and rapid decay. They can occur in repetition or as a single event. Examples of impulsive sound sources include explosives, seismic airguns, and impact pile drivers.

isopleth

A line drawn on a map through all points having the same value of some quantity.

knot

One nautical mile per hour. Symbol: kn.

level

A measure of a quantity expressed as the logarithm of the ratio of the quantity to a specified reference value of that quantity. Examples include sound pressure level, sound exposure level, and peak sound pressure level. For example, a value of sound exposure level with reference to 1 μPa^2 s can be written in the form *x* dB re 1 μPa^2 s.

low-frequency (LF) cetacean

See **hearing group**.

median

The 50th percentile of a statistical distribution.

mid-frequency (MF) cetacean

See **hearing group**.

monopole source level (MSL)

A source level that has been calculated using an acoustic model that accounts for the effect of the sea-surface and seabed on sound propagation, assuming a point-like (monopole) sound source.

M-weighting

See **auditory frequency weighting function** (as proposed by Southall et al. 2007).

mysticete

A suborder of cetaceans that use baleen plates to filter food from water. Members of this group include rorquals (Balaenopteridae), right whales (Balaenidae), and grey whales (*Eschrichtius robustus*).

non-impulsive sound

Sound that is not an impulsive sound. A non-impulsive sound is not necessarily a continuous sound.

octave

The interval between a sound and another sound with double or half the frequency. For example, one octave above 200 Hz is 400 Hz, and one octave below 200 Hz is 100 Hz.

odontocete

The presence of teeth, rather than baleen, characterizes these whales. Members of the Odontoceti are a suborder of cetaceans, a group comprised of whales, dolphins, and porpoises. The skulls of toothed whales are mostly asymmetric, an adaptation for their echolocation. This group includes sperm whales, killer whales, belugas, narwhals, dolphins, and porpoises.

otariid

A common term used to describe members of the Otariidae, eared seals, commonly called sea lions and fur seals. Otariids are adapted to a semi-aquatic life; they use their large fore flippers for propulsion. Their ears distinguish them from phocids. Otariids are one of the three main groups in the superfamily Pinnipedia; the other two groups are phocids and walrus.

otariid pinnipeds in water (OPW)

See **hearing group**.

other marine carnivores in air (OCA)

See **hearing group**.

other marine carnivores in water (OCW)

See **hearing group**.

parabolic equation method

A computationally efficient solution to the acoustic wave equation that is used to model propagation loss. The parabolic equation approximation omits effects of back-scattered sound, simplifying the computation of propagation loss. The effect of back-scattered sound is negligible for most ocean-acoustic propagation problems.

peak sound pressure level (zero-to-peak sound pressure level)

The level ($L_{p,pk}$ or L_{pk}) of the squared maximum magnitude of the sound pressure (p^2_{pk}). Unit: decibel (dB). Reference value (p_0^2) for sound in water: 1 µPa².

$$L_{p,\mathrm{pk}} := 10\log_{10}\left(p^2_{\mathrm{pk}}/p_0^2\right)\,\mathrm{dB} \; = 20\log_{10}\left(p_{\mathrm{pk}}/p_0\right)\,\mathrm{dB}$$

The frequency band and time window should be specified. Abbreviation: PK or L_{pk}.

peak-to-peak sound pressure

The difference between the maximum and minimum sound pressure over a specified frequency band and time window. Unit: pascal (Pa).

permanent threshold shift (PTS)

An irreversible loss of hearing sensitivity caused by excessive noise exposure. PTS is considered auditory injury.

phocid

A common term used to describe all members of the family Phocidae. These true/earless seals are more adapted to in-water life than are otariids, which have more terrestrial adaptations. Phocids use their hind flippers to propel themselves. Phocids are one of the three main groups in the superfamily Pinnipedia; the other two groups are otariids and walrus.

phocid pinnipeds in water (PPW)

See **hearing group**.

pinniped

A common term used to describe all three groups that form the superfamily Pinnipedia: phocids (true seals or earless seals), otariids (eared seals or fur seals and sea lions), and walrus.

point source

A source that radiates sound as if from a single point.

power spectral density source level

A property of a sound source obtained by adding to the power spectral density level of the sound pressure measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 $\mu Pa^2 m^2/Hz$.

pressure, acoustic

The deviation from the ambient pressure caused by a sound wave. Also called sound pressure. Unit: pascal (Pa).

pressure, hydrostatic

The pressure at any given depth in a static liquid that is the result of the weight of the liquid acting on a unit area at that depth, plus any pressure acting on the surface of the liquid. Unit: pascal (Pa).

propagation loss (PL)

Difference between a source level (SL) and the level at a specified location, $PL(x) = SL - L(x)$. Also see **transmission loss**.

received level

The level measured (or that would be measured) at a defined location. The type of level should be specified.

reference values

standard underwater references values used for calculating sound **levels**, e.g., the reference value for expressing sound pressure level in decibels is 1 μPa.

Quantity	Reference value
Sound pressure	1 μPa
Sound exposure	1 μPa^2 s
Sound particle displacement	1 pm
Sound particle velocity	1 nm/s
Sound particle acceleration	1 μm/s^2

rms

abbreviation for root-mean-square.

shear wave

A mechanical vibration wave in which the direction of particle motion is perpendicular to the direction of propagation. Also called a secondary wave or S-wave. Shear waves propagate only in solid media, such as sediments or rock. Shear waves in the seabed can be converted to compressional waves in water at the water-seabed interface.

sound

A time-varying disturbance in the pressure, stress, or material displacement of a medium propagated by local compression and expansion of the medium.

sound exposure

Time integral of squared sound pressure over a stated time interval. The time interval can be a specified time duration (e.g., 24 hours) or from start to end of a specified event (e.g., a pile strike, an airgun pulse, a construction operation). Unit: Pa^2 s.

sound exposure level

The level (L_E) of the sound exposure (E). Unit: decibel (dB). Reference value (E_0) for sound in water: 1 μPa^2 s.

$$L_E := 10\log_{10}(E/E_0)\,\mathrm{dB} \ = 20\log_{10}\left(E^{1/2}/E_0^{1/2}\right)\,\mathrm{dB}$$

The frequency band and integration time should be specified. Abbreviation: SEL.

sound exposure spectral density

Distribution as a function of frequency of the time-integrated squared sound pressure per unit bandwidth of a sound having a continuous spectrum. Unit: Pa^2 s/Hz.

sound field

Region containing sound waves.

sound intensity

Product of the sound pressure and the sound particle velocity. The magnitude of the sound intensity is the sound energy flowing through a unit area perpendicular to the direction of propagation per unit time.

sound particle acceleration

The rate of change of sound particle velocity. Unit: metre per second squared (m/s^2). Symbol: *a*.

sound particle motion

smallest volume of a medium that represents its mean physical properties.

sound particle displacement

Displacement of a material element caused by the action of sound, where a material element is the smallest element of the medium that represents the medium's mean density.

sound particle velocity

The velocity of a particle in a material moving back and forth in the direction of the pressure wave. Unit: metre per second (m/s). Symbol: *v*.

sound pressure

The contribution to total pressure caused by the action of sound.

sound pressure level (rms sound pressure level)

The level ($\mathrm{L_{p,rms}}$) of the time-mean-square sound pressure (p_{rms}^2). Unit: decibel (dB). Reference value (p_0^2) for sound in water: 1 μPa^2.

$$L_{p,\mathrm{rms}} := 10\log_{10}(p_{\mathrm{rms}}^2/p_0^2)\ \mathrm{dB}\ = 20\log_{10}(p_{\mathrm{rms}}/p_0)\ \mathrm{dB}$$

The frequency band and averaging time should be specified. Abbreviation: SPL or Lrms.

sound speed profile

The speed of sound in the water column as a function of depth below the water surface.

soundscape

The characterization of the ambient sound in terms of its spatial, temporal, and frequency attributes, and the types of sources contributing to the sound field.

source level (SL)

A property of a sound source obtained by adding to the sound pressure level measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 μPa^{2}m^2.

spectrum

An acoustic signal represented in terms of its power, energy, mean-square sound pressure, or sound exposure distribution with frequency.

surface duct

The upper portion of a water column within which the sound speed profile gradient causes sound to refract upward and therefore reflect off the surface resulting in relatively long-range sound propagation with little loss.

temporary threshold shift (TTS)

Reversible loss of hearing sensitivity. TTS can be caused by noise exposure.

thermocline

The depth interval near the ocean surface that experiences temperature gradients due to warming or cooling by heat conduction from the atmosphere and by warming from solar heating.

transmission loss (TL)

The difference between a specified level at one location and that at a different location, TL(x1,x2) = L(x1) − L(x2). Also see **propagation loss**.

unweighted

Term indicating that no frequency weighting function is applied. Synonymous with flat weighting.

very high-frequency (VHF) cetacean

See **hearing group**.

very low-frequency (VLF) cetacean

See **hearing group**.

wavelength

Distance over which a wave completes one cycle of oscillation. Unit: metre (m). Symbol: λ.

Literature Cited

[ANSI] American National Standards Institute and [ASA] Acoustical Society of America. S1.1-2013. *American National Standard: Acoustical Terminology*. NY, USA. https://webstore.ansi.org/Standards/ASA/ANSIASAS12013.

[ANSI] American National Standards Institute and [ASA] Acoustical Society of America. S1.13-2005 (R2010). *American National Standard: Measurement of Sound Pressure Levels in Air*. NY, USA. https://webstore.ansi.org/Standards/ASA/ANSIASAS1132005R2010.

[DEWHA] Department of the Environment, Water, Heritage, and the Arts (Australia). 2008. *EPBC Act Policy Statement 2.1 - Interaction Between Offshore Seismic Exploration and Whales*. 14 p. http://www.environment.gov.au/resource/epbc-act-policy-statement-21-interaction-between-offshore-seismic-exploration-and-whales.

[HESS] High Energy Seismic Survey. 1999. *High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys Offshore Southern California*. Prepared for the California State Lands Commission and the United States Minerals Management Service Pacific Outer Continental Shelf Region by the High Energy Seismic Survey Team, Camarillo, CA, USA. 98 p. https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB2001100103.xhtml.

[ISO] International Organization for Standardization. 2006. *ISO 80000-3:2006 Quantities and units – Part 3: Space and time*. https://www.iso.org/standard/31888.html.

[ISO] International Organization for Standardization. 2017. *ISO 18405:2017. Underwater acoustics – Terminology*. Geneva. https://www.iso.org/standard/62406.html.

[NMFS] National Marine Fisheries Service (US). 1998. *Acoustic Criteria Workshop*. Dr. Roger Gentry and Dr. Jeanette Thomas Co-Chairs.

[NMFS] National Marine Fisheries Service (US). 2016. *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts*. US Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-55. 178 p.

[NMFS] National Marine Fisheries Service (US). 2018. *2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts*. US Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59. 167 p. https://media.fisheries.noaa.gov/dam-migration/tech_memo_acoustic_guidance_(20)_(pdf)_508.pdf.

[NOAA] National Oceanic and Atmospheric Administration (US). 2013. *Draft guidance for assessing the effects of anthropogenic sound on marine mammals: Acoustic threshold levels for onset of permanent and temporary threshold shifts*. National Oceanic and Atmospheric Administration, US Department of Commerce, and NMFS Office of Protected Resources, Silver Spring, MD, USA. 76 p.

[NOAA] National Oceanic and Atmospheric Administration (US). 2015. *Draft guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic threshold levels for onset of permanent and temporary threshold shifts*. NMFS Office of Protected Resources, Silver Spring, MD, USA. 180 p.

[NOAA] National Oceanic and Atmospheric Administration (US). 2016. *Document Containing Proposed Changes to the NOAA Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts*. National Oceanic and Atmospheric Administration and US Department of Commerce. 24 p.

[NOAA] National Oceanic and Atmospheric Administration (US). 2018. Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Marine Site Characterization Surveys off of Delaware. *Federal Register* 83(65): 14417-14443. https://www.federalregister.gov/d/2018-12225.

[NOAA] National Oceanic and Atmospheric Administration (US). 2019. *ESA Section 7 Consultation Tools for Marine Mammals on the West Coast* (web page), 27 Sep 2019. https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west.

[NSF] National Science Foundation (US). 2011. *Final Programmatic Environmental Impact Statement/Overseas. Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the US Geological Survey*. National Science Foundation, Arlington, VA, USA. https://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf.

[ONR] Office of Naval Research. 1998. *ONR Workshop on the Effect of Anthropogenic Noise in the Marine Environment*. Dr. R. Gisiner, Chair.

Aerts, L.A.M., M. Blees, S.B. Blackwell, C.R. Greene, Jr., K.H. Kim, D.E. Hannay, and M.E. Austin. 2008. *Marine mammal monitoring and mitigation during BP Liberty OBC seismic survey in Foggy Island Bay, Beaufort Sea, July-August 2008: 90-day report*. Document P1011-1. Report by LGL Alaska Research Associates Inc., LGL Ltd., Greeneridge Sciences Inc., and JASCO Applied Sciences for BP Exploration Alaska. 199 p. ftp://ftp.library.noaa.gov/noaa_documents.lib/NMFS/Auke%20Bay/AukeBayScans/Removable%20Disk/P1011-1.pdf.

Ainslie, M.A. 2008. *Review of Published Safety Thresholds for Human Divers Exposed to Underwater Sound (Veilige maximale geluidsniveaus voor duikers-beoordeling van publicaties)*. Report TNO-DV-2007-A598. DTIC Document, TNO Defence Security and Safety, The Hague (Netherlands). 17 p. http://www.dtic.mil/dtic/tr/fulltext/u2/a485758.pdf

Athy, L.F. 1930. Density, porosity and compactation of sedimentary rocks. *American Association of Petroleum Geologists Bulletin* 14(1): 1-24. https://doi.org/10.1306/3D93289E-16B1-11D7-8645000102C1865D.

Austin, M.E. and G.A. Warner. 2012. *Sound Source Acoustic Measurements for Apache's 2012 Cook Inlet Seismic Survey*. Version 2.0. Technical report by JASCO Applied Sciences for Fairweather LLC and Apache Corporation.

Austin, M.E. and L. Bailey. 2013. *Sound Source Verification: TGS Chukchi Sea Seismic Survey Program 2013*. Document 00706, Version 1.0. Technical report by JASCO Applied Sciences for TGS-NOPEC Geophysical Company.

Austin, M.E., A. McCrodan, C. O'Neill, Z. Li, and A.O. MacGillivray. 2013. *Marine mammal monitoring and mitigation during exploratory drilling by Shell in the Alaskan Chukchi and Beaufort Seas, July–November 2012: 90-Day Report*. *In*: Funk, D.W., C.M. Reiser, and W.R. Koski (eds.). Underwater Sound Measurements. LGL Rep. P1272D–1. Report from LGL Alaska Research Associates Inc. and JASCO Applied Sciences, for Shell Offshore Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. 266 pp plus appendices.

Austin, M.E. 2014. Underwater noise emissions from drillships in the Arctic. *In*: Papadakis, J.S. and L. Bjørnø (eds.). *UA2014 - 2nd International Conference and Exhibition on Underwater Acoustics*. 22-27 Jun 2014, Rhodes, Greece. pp. 257-263.

Austin, M.E., H. Yurk, and R. Mills. 2015. *Acoustic Measurements and Animal Exclusion Zone Distance Verification for Furie's 2015 Kitchen Light Pile Driving Operations in Cook Inlet*. Version 2.0. Technical report by JASCO Applied Sciences for Jacobs LLC and Furie Alaska.

Austin, M.E. and Z. Li. 2016. *Marine Mammal Monitoring and Mitigation During Exploratory Drilling by Shell in the Alaskan Chukchi Sea, July–October 2015: Draft 90-day report*. *In*: Ireland, D.S. and L.N. Bisson (eds.). Underwater Sound Measurements. LGL Rep. P1363D. Report from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Applied Sciences Ltd. For Shell Gulf of Mexico Inc, National Marine Fisheries Service, and US Fish and Wildlife Service. 188 pp + appendices.

Australian Government - Department of the Environment. 2015-2025. *Conservation Management Plan for the Blue Whale: A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, 2015. 57 p.

http://www.environment.gov.au/system/files/resources/9c058c02-afd1-4e5d-abff-11cac2ebc486/files/blue-whale-conservation-management-plan.pdf.

Bartol, S.M. and D.R. Ketten. 2006. *Turtle and tuna hearing*. *In*: Swimmer, Y. and R. Brill (eds.). Sea turtle and pelagic fish sensory biology: Developing techniques to reduce sea turtle bycatch in longline fisheries. Volume December 2006. NOAA Technical Memorandum NMFS-PIFSC-7. 98-103 p. http://www.sefsc.noaa.gov/turtles/TM_NMFS_PIFSC_7_Swimmer_Brill.pdf#page=108.

Baumgartner, M.F. and B.R. Mate. 2003. Summertime foraging ecology of North Atlantic right whales. *Marine Ecology Progress Series* 264: 123-135. https://doi.org/10.3354/meps264123.

Buckingham, M.J. 2005. Compressional and shear wave properties of marine sediments: Comparisons between theory and data. *Journal of the Acoustical Society of America* 117: 137-152. https://doi.org/10.1121/1.1810231.

Carnes, M.R. 2009. *Description and Evaluation of GDEM-V 3.0*. US Naval Research Laboratory, Stennis Space Center, MS. NRL Memorandum Report 7330-09-9165. 21 p. https://apps.dtic.mil/dtic/tr/fulltext/u2/a494306.pdf.

Collins, M.D. 1993. A split-step Padé solution for the parabolic equation method. *Journal of the Acoustical Society of America* 93(4): 1736-1742. https://doi.org/10.1121/1.406739.

Collins, M.D., R.J. Cederberg, D.B. King, and S. Chin-Bing. 1996. Comparison of algorithms for solving parabolic wave equations. *Journal of the Acoustical Society of America* 100(1): 178-182. https://doi.org/10.1121/1.415921.

Coppens, A.B. 1981. Simple equations for the speed of sound in Neptunian waters. *Journal of the Acoustical Society of America* 69(3): 862-863. https://doi.org/10.1121/1.382038.

Cusano, D.A., L.A. Conger, S.M. Van Parijs, and S.E. Parks. 2019. Implementing conservation measures for the North Atlantic right whale: Considering the behavioral ontogeny of mother-calf pairs. *Animal Conservation* 22(3): 228-237. https://doi.org/10.1111/acv.12457.

Day, R.D., R.D. McCauley, Q.P. Fitzgibbon, K. Hartmann, J.M. Semmens, and Institute for Marine and Antarctic Studies. 2016a. *Assessing the Impact of Marine Seismic Surveys on Southeast Australian Scallop and Lobster Fisheries*. Impacts of Marine Seismic Surveys on Scallop and Lobster Fisheries. Fisheries Ressearch & Development Corporation. FRDC Project No 2012/008, University of Tasmania, Hobart. 159 p.

Day, R.D., R.D. McCauley, Q.P. Fitzgibbon, and J.M. Semmens. 2016b. Seismic air gun exposure during early-stage embryonic development does not negatively affect spiny lobster *Jasus edwardsii larvae* (Decapoda:Palinuridae). *Scientific Reports* 6: 1-9. https://doi.org/10.1038/srep22723.

Day, R.D., R.D. McCauley, Q.P. Fitzgibbon, K. Hartmann, and J.M. Semmens. 2017. Exposure to seismic air gun signals causes physiological harm and alters behavior in the scallop *Pecten fumatus*. *Proceedings of the National Academy of Sciences of the United States of America* 114(40): E8537-E8546. https://doi.org/10.1073/pnas.1700564114.

Day, R.D., R.D. McCauley, Q.P. Fitzgibbon, K. Hartmann, and J.M. Semmens. 2019. Seismic air guns damage rock lobster mechanosensory organs and impair righting reflex. *Proceedings of the Royal Society B* 286(1907). https://doi.org/10.1098/rspb.2019.1424.

Department of the Environment and Energy, NSW Government, and Queensland Government. 2017. *Recovery Plan for Marine Turtles in Australia*. https://www.environment.gov.au/marine/publications/recovery-plan-marine-turtles-australia-2017.

Dombroski, J.R., S.E. Parks, and D.P. Nowacek. 2021. Dive behavior of North Atlantic right whales on the calving ground in the Southeast USA: implications for conservation. *Endangered Species Research* 46: 35-48.

Dow Piniak, W.E., S.A. Eckert, C.A. Harms, and E.M. Stringer. 2012. *Underwater hearing sensitivity of the leatherback sea turtle (Dermochelys coriacea): Assessing the potential effect of anthropogenic noise*. US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2012-00156. 35 p.

Dragoset, W.H. 1984. A comprehensive method for evaluating the design of airguns and airgun arrays. *16th Annual Offshore Technology Conference* Volume 3, 7–9 May 1984. OTC 4747, Houston, TX, USA. pp. 75–84. https://doi.org/10.4043/4783-MS.

Ellison, W.T., C.W. Clark, and G.C. Bishop. 1987. *Potential use of surface reverberation by bowhead whales, Balaena mysticetus, in under-ice navigation: Preliminary considerations*. Report of the International Whaling Commission. Volume 37. 329-332 p.

Ellison, W.T. and P.J. Stein. 1999. *SURTASS LFA High Frequency Marine Mammal Monitoring (HF/M3) Sonar: Sustem Description and Test & Evaluation*. Under US Navy Contract N66604-98-D-5725. http://www.surtass-lfa-eis.com/wp-content/uploads/2018/02/HF-M3-Ellison-Report-2-4a.pdf.

Ellison, W.T. and A.S. Frankel. 2012. A common sense approach to source metrics. *In* Popper, A.N. and A.D. Hawkins (eds.). *The Effects of Noise on Aquatic Life*. Volume 730. Springer, New York. pp. 433-438. https://doi.org/10.1007/978-1-4419-7311-5_98.

Feary, D.A., Hine, A.C., Malone, M.J., et al. 2000. *Proceesings of the Ocean Drilling Program, Initial Reports*. Volume 182.

Fewtrell, J.L. and R.D. McCauley. 2012. Impact of air gun noise on the behaviour of marine fish and squid. *Marine Pollution Bulletin* 64(5): 984-993. https://doi.org/10.1016/j.marpolbul.2012.02.009.

Finneran, J.J. and C.E. Schlundt. 2010. Frequency-dependent and longitudinal changes in noise-induced hearing loss in a bottlenose dolphin (*Tursiops truncatus*). *Journal of the Acoustical Society of America* 128(2): 567-570. https://doi.org/10.1121/1.3458814.

Finneran, J.J. and A.K. Jenkins. 2012. *Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis*. SPAWAR Systems Center Pacific, San Diego, CA, USA. 64 p.

Finneran, J.J. 2015. *Auditory weighting functions and TTS/PTS exposure functions for cetaceans and marine carnivores*. Technical report by SSC Pacific, San Diego, CA, USA.

Finneran, J.J. 2016. *Auditory weighting functions and TTS/PTS exposure functions for marine mammals exposed to underwater noise*. Technical Report for Space and Naval Warfare Systems Center Pacific, San Diego, CA, USA. 49 p. https://apps.dtic.mil/dtic/tr/fulltext/u2/1026445.pdf.

Finneran, J.J., E.E. Henderson, D.S. Houser, K. Jenkins, S. Kotecki, and J. Mulsow. 2017. *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*. Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific). 183 p. https://nwtteis.com/portals/nwtteis/files/technical_reports/Criteria_and_Thresholds_for_U.S._Navy_Acoustic_and_Explosive_Effects_Analysis_June2017.pdf.

Fisher, F.H. and V.P. Simmons. 1977. Sound absorption in sea water. *Journal of the Acoustical Society of America* 62(3): 558-564. https://doi.org/10.1121/1.381574.

Frankel, A.S., W.T. Ellison, and J. Buchanan. 2002. Application of the acoustic integration model (AIM) to predict and minimize environmental impacts. *OCEANS'02 MTS/IEEE*. pp. 1438-1443.

Funk, D.W., D.E. Hannay, D.S. Ireland, R. Rodrigues, and W.R. Koski. 2008. *Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–November 2007: 90-day report*. LGL Report P969-1. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. for Shell Offshore Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. 218 p. http://www-static.shell.com/static/usa/downloads/alaska/shell2007_90-d_final.pdf.

Goldbogen, J.A., J. Calambokidis, E. Oleson, J. Potvin, N.D. Pyenson, G. Schorr, and R.E. Shadwick. 2011. Mechanics, hydrodynamics and energetics of blue whale lunge feeding: Efficiency dependence on krill density. *Journal of Experimental Biology* 214: 131-146. https://doi.org/10.1242/jeb.054726.

Hannay, D.E. and R. Racca. 2005. *Acoustic Model Validation*. Document 0000-S-90-04-T-7006-00-E, Revision 02, Version 1.3. Technical report by JASCO Research Ltd. for Sakhalin Energy Investment Company Ltd. 34 p.

Heap, A.D. 2009. *Marine Sediments (MARS) Database* (webpage). Commonwealth of Australia (Geoscience Australia), Creative Commons Attribution 4.0 International Licence. http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_69869.

Heyward, A., J. Colquhoun, E. Cripps, D. McCorry, M. Stowar, B. Radford, K. Miller, I. Miller, and C. Battershill. 2018. No evidence of damage to the soft tissue or skeletal integrity of mesophotic corals exposed to a 3D marine seismic survey. *Marine Pollution Bulletin* 129(1): 8-13. https://doi.org/10.1016/j.marpolbul.2018.01.057.

Houser, D.S. and M.J. Cross. 1999. *Marine Mammal Movement and Behavior (3MB): A Component of the Effects of Sound on the Marine Environment (ESME) Distributed Model*. Version 8.08, by BIOMIMETICA.

Houser, D.S. 2006. A method for modeling marine mammal movement and behavior for environmental impact assessment. *IEEE Journal of Oceanic Engineering* 31(1): 76-81. https://doi.org/10.1109/JOE.2006.872204.

Ireland, D.S., R. Rodrigues, D.W. Funk, W.R. Koski, and D.E. Hannay. 2009. *Marine mammal monitoring and mitigation during open water seismic exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October 2008: 90-Day Report*. Document P1049-1. 277 p.

Irvine, L.M., D.M. Palacios, B.A. Lagerquist, and B.R. Mate. 2019. Scales of Blue and Fin Whale Feeding Behavior off California, USA, With Implications for Prey Patchiness. *Frontiers in Ecology and Evolution* 7(338). https://doi.org/10.3389/fevo.2019.00338.

Jensen, F.B., W.A. Kuperman, M.B. Porter, and H. Schmidt. 2011. *Computational Ocean Acoustics*. 2nd edition. AIP Series in Modern Acoustics and Signal Processing. AIP Press - Springer, New York. 794 p. https://doi.org/10.1007/978-1-4419-8678-8.

Landrø, M. 1992. Modeling of GI gun signatures. *Geophysical Prospecting* 40(7): 721–747. https://doi.org/10.1111/j.1365-2478.1992.tb00549.x.

Laws, R.M., L. Hatton, and M. Haartsen. 1990. Computer modelling of clustered airguns. *First Break* 8(9): 331–338. https://doi.org/10.3997/1365-2397.1990017.

Lucke, K., U. Siebert, P.A. Lepper, and M.-A. Blanchet. 2009. Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. *Journal of the Acoustical Society of America* 125(6): 4060-4070. https://doi.org/10.1121/1.3117443.

Lurton, X. 2002. *An Introduction to Underwater Acoustics: Principles and Applications*. Springer, Chichester, UK. 347 p.

MacGillivray, A.O. and N.R. Chapman. 2012. Modeling underwater sound propagation from an airgun array using the parabolic equation method. *Canadian Acoustics* 40(1): 19-25. https://jcaa.caa-aca.ca/index.php/jcaa/article/view/2502/2251.

MacGillivray, A.O. 2018. Underwater noise from pile driving of conductor casing at a deep-water oil platform. *Journal of the Acoustical Society of America* 143(1): 450-459. https://doi.org/10.1121/1.5021554.

Mackay, A.I., F. Bailleul, E.L. Carroll, V. Andrews-Goff, C.S. Baker, J. Bannister, L. Boren, K. Carlyon, D.M. Donnelly, et al. 2020. Satellite derived offshore migratory movements of southern right whales (*Eubalaena australis*) from Australian and New Zealand wintering grounds. *PLOS ONE* 15(5): e0231577. https://doi.org/10.1371/journal.pone.0231577.

Malme, C.I., P.R. Miles, C.W. Clark, P.L. Tyack, and J.E. Bird. 1984. *Investigations of the Potential Effects of Underwater Noise from Petroleum Industry Activities on Migrating Gray Whale Behavior. Phase II: January 1984 Migration*. Report 5586. Report by Bolt Beranek and Newman Inc. for the US Department of the Interior, Minerals Management Service, Cambridge, MA, USA. https://www.boem.gov/sites/default/files/boem-newsroom/Library/Publications/1983/rpt5586.pdf.

Martin, S.B., K. Bröker, M.-N.R. Matthews, J.T. MacDonnell, and L. Bailey. 2015. Comparison of measured and modeled air-gun array sound levels in Baffin Bay, West Greenland. *OceanNoise 2015*. 11-15 May 2015, Barcelona, Spain.

Martin, S.B. and A.N. Popper. 2016. Short- and long-term monitoring of underwater sound levels in the Hudson River (New York, USA). *Journal of the Acoustical Society of America* 139(4): 1886-1897. https://doi.org/10.1121/1.4944876.

Martin, S.B., J.T. MacDonnell, and K. Bröker. 2017a. Cumulative sound exposure levels—Insights from seismic survey measurements. *Journal of the Acoustical Society of America* 141(5): 3603-3603. https://doi.org/10.1121/1.4987709.

Martin, S.B., M.-N.R. Matthews, J.T. MacDonnell, and K. Bröker. 2017b. Characteristics of seismic survey pulses and the ambient soundscape in Baffin Bay and Melville Bay, West Greenland. *Journal of the Acoustical Society of America* 142(6): 3331-3346. https://doi.org/10.1121/1.5014049.

Matthews, M.-N.R. and A.O. MacGillivray. 2013. Comparing modeled and measured sound levels from a seismic survey in the Canadian Beaufort Sea. *Proceedings of Meetings on Acoustics* 19(1): 1-8. https://doi.org/10.1121/1.4800553.

Mattsson, A. and M. Jenkerson. 2008. Single Airgun and Cluster Measurement Project. *Joint Industry Programme (JIP) on Exploration and Production Sound and Marine Life Proramme Review*. 28-30 Oct 2008. International Association of Oil and Gas Producers, Houston, TX, USA.

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, et al. 2000a. Marine seismic surveys: A study of environmental implications. *Australian Petroleum Production Exploration Association (APPEA) Journal* 40(1): 692-708. https://doi.org/10.1071/AJ99048.

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, et al. 2000b. *Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid*. Report R99-15. Prepared for Australian Petroleum Production Exploration Association by Centre for Maine Science and Technology, Western Australia. 198 p. https://cmst.curtin.edu.au/wp-content/uploads/sites/4/2016/05/McCauley-et-al-Seismic-effects-2000.pdf.

McCauley, R.D. 2021. *Star of the South Victoria, ambient sea noise and great whale patterns March 2020 to March 2021.* . Report 2021-09. Prepared for RPS Australia by Centre for Marine Science and Technology, Curtin University, Western Australia. 66 p.

McCrodan, A., C.R. McPherson, and D.E. Hannay. 2011. *Sound Source Characterization (SSC) Measurements for Apache's 2011 Cook Inlet 2D Technology Test*. Version 3.0. Technical report by JASCO Applied Sciences for Fairweather LLC and Apache Corporation. 51 p.

McPherson, C.R. and G.A. Warner. 2012. *Sound Sources Characterization for the 2012 Simpson Lagoon OBC Seismic Survey 90-Day Report*. Document 00443, Version 2.0. Technical report by JASCO Applied Sciences for BP Exploration (Alaska) Inc.

McPherson, C.R., K. Lucke, B.J. Gaudet, S.B. Martin, and C.J. Whitt. 2018. *Pelican 3-D Seismic Survey Sound Source Characterisation*. Document 001583. Version 1.0. Technical report by JASCO Applied Sciences for RPS Energy Services Pty Ltd.

McPherson, C.R. and S.B. Martin. 2018. *Characterisation of Polarcus 2380 in^3 Airgun Array*. Document 001599, Version 1.0. Technical report by JASCO Applied Sciences for Polarcus Asia Pacific Pte Ltd.

Möller, L.M., C.R.M. Attard, K. Bilgmann, V. Andrews-Goff, I. Jonsen, D. Paton, and M.C. Double. 2020. Movements and behaviour of blue whales satellite tagged in an Australian upwelling system. *Scientific Reports* 10(1): 21165. https://doi.org/10.1038/s41598-020-78143-2.

Nedwell, J.R. and A.W. Turnpenny. 1998. The use of a generic frequency weighting scale in estimating environmental effect. *Workshop on Seismics and Marine Mammals*. 23–25 Jun 1998, London, UK.

Nedwell, J.R., A.W. Turnpenny, J. Lovell, S.J. Parvin, R. Workman, J.A.L. Spinks, and D. Howell. 2007. *A validation of the dB$_{ht}$ as a measure of the behavioural and auditory effects of underwater noise*. Document 534R1231 Report prepared by Subacoustech Ltd. for Chevron Ltd, TotalFinaElf Exploration UK PLC, Department of Business, Enterprise and Regulatory Reform, Shell UK Exploration and Production Ltd, The Industry Technology Facilitator, Joint Nature Conservation Committee, and The UK Ministry of Defence. 74 p. https://tethys.pnnl.gov/sites/default/files/publications/Nedwell-et-al-2007.pdf.

Nielsen, M.L., L. Bejder, S.K. Videsen, F. Christiansen, and P.T. Madsen. 2019. Acoustic crypsis in southern right whale mother–calf pairs: infrequent, low-output calls to avoid predation? *Journal of Experimental Biology* 222(13): jeb190728.

Nousek McGregor, A.E. 2010. *The cost of locomotion in North Atlantic right whales Eubalaena glacialis*. PhD Thesis, Dissertation. Duke University. https://hdl.handle.net/10161/3088.

O'Neill, C., D. Leary, and A. McCrodan. 2010. Sound Source Verification. (Chapter 3) *In* Blees, M.K., K.G. Hartin, D.S. Ireland, and D.E. Hannay (eds.). *Marine mammal monitoring and mitigation during open water seismic exploration by Statoil USA E&P Inc. in the Chukchi Sea, August-October 2010: 90-day report*. LGL Report P1119. Prepared by LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Applied Sciences Ltd. for Statoil USA E&P Inc., National Marine Fisheries Service (US), and US Fish and Wildlife Service. pp. 1-34.

Parvin, S. 2005. *Limits for underwater noise exposure of human divers and swimmers [presentation]*. Subacoustech. Presented at the National Physics Laboratory Seminar on Underwater Acoustics, Teddington, UK. http://www.subacoustech.com/wp-content/uploads/NPLDiverNoisePresentation.pdf.

Payne, J.F., C. Andrews, L. Fancey, D. White, and J. Christian. 2008. *Potential Effects of Seismic Energy on Fish and Shellfish: An Update since 2003*. Report 2008/060. Canadian Science Advisory Secretariat. 22 p. https://waves-vagues.dfo-mpo.gc.ca/Library/335123.pdf.

Payne, R. and D. Webb. 1971. Orientation by means of long range acoustic signaling in baleen whales. *Annals of the New York Academy of Sciences* 188: 110-141. https://doi.org/10.1111/j.1749-6632.1971.tb13093.x.

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, et al. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*. ASA S3/SC1.4 TR-2014. SpringerBriefs in Oceanography. ASA Press and Springer. https://doi.org/10.1007/978-3-319-06659-2.

Porter, M.B. and Y.C. Liu. 1994. Finite-element ray tracing. *In*: Lee, D. and M.H. Schultz (eds.). *International Conference on Theoretical and Computational Acoustics*. Volume 2. World Scientific Publishing Co. pp. 947-956.

Racca, R., A.N. Rutenko, K. Bröker, and M.E. Austin. 2012a. A line in the water - design and enactment of a closed loop, model based sound level boundary estimation strategy for mitigation of behavioural impacts from a seismic survey. *11th European Conference on Underwater Acoustics*. Volume 34(3), Edinburgh, UK.

Racca, R., A.N. Rutenko, K. Bröker, and G. Gailey. 2012b. Model based sound level estimation and in-field adjustment for real-time mitigation of behavioural impacts from a seismic survey and post-event evaluation of sound exposure for individual whales. *In*: McMinn, T. (ed.). *Acoustics 2012*. Fremantle, Australia. http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p92.pdf.

Racca, R., M.E. Austin, A.N. Rutenko, and K. Bröker. 2015. Monitoring the gray whale sound exposure mitigation zone and estimating acoustic transmission during a 4-D seismic survey, Sakhalin Island, Russia. *Endangered Species Research* 29(2): 131-146. https://doi.org/10.3354/esr00703.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, et al. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33(4): 411-521. https://doi.org/10.1080/09524622.2008.9753846.

Southall, B.L., D.P. Nowaceck, P.J.O. Miller, and P.L. Tyack. 2016. Experimental field studies to measure behavioral responses of cetaceans to sonar. *Endangered Species Research* 31: 293-315. https://doi.org/10.3354/esr00764.

Southall, B.L., J.J. Finneran, C.J. Reichmuth, P.E. Nachtigall, D.R. Ketten, A.E. Bowles, W.T. Ellison, D.P. Nowacek, and P.L. Tyack. 2019. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* 45(2): 125-232. https://doi.org/10.1578/AM.45.2.2019.125.

Southall, B.L., D.P. Nowacek, A.E. Bowles, V. Senigaglia, L. Bejder, and P.L. Tyack. 2021. Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioral Responses to Human Noise. *Aquatic Mammals* 47(5): 421-464. https://doi.org/10.1578/AM.47.5.2021.421.

Stamation, K., M. Watson, P. Moloney, C. Charlton, and J. Bannister. 2020. Population estimate and rate of increase of southern right whales Eubalaena australis in southeastern Australia. *Endangered Species Research* 41: 373-383.

Teague, W.J., M.J. Carron, and P.J. Hogan. 1990. A comparison between the Generalized Digital Environmental Model and Levitus climatologies. *Journal of Geophysical Research* 95(C5): 7167-7183. https://doi.org/10.1029/JC095iC05p07167.

Warner, G.A., C. Erbe, and D.E. Hannay. 2010. Underwater Sound Measurements. (Chapter 3) *In* Reiser, C.M., D. Funk, R. Rodrigues, and D.E. Hannay (eds.). *Marine Mammal Monitoring and Mitigation during Open Water Shallow Hazards and Site Clearance Surveys by Shell Offshore Inc. in the Alaskan Chukchi Sea, July-October 2009: 90-Day Report*. LGL Report P1112-1. Report by LGL Alaska Research Associates Inc. and JASCO Applied Sciences for Shell Offshore Inc., National Marine Fisheries Service (US), and Fish and Wildlife Service (US). pp. 1-54.

Warner, G.A., M.E. Austin, and A.O. MacGillivray. 2017. Hydroacoustic measurements and modeling of pile driving operations in Ketchikan, Alaska [Abstract]. *Journal of the Acoustical Society of America* 141(5): 3992. https://doi.org/10.1121/1.4989141.

Whiteway, T. 2009. *Australian Bathymetry and Topography Grid, June 2009*. GeoScience Australia, Canberra. http://pid.geoscience.gov.au/dataset/ga/67703.

Wood, J.D., B.L. Southall, and D.J. Tollit. 2012. *PG&E offshore 3-D Seismic Survey Project Environmental Impact Report–Marine Mammal Technical Draft Report*. Report by SMRU Ltd. 121 p. https://www.coastal.ca.gov/energy/seismic/mm-technical-report-EIR.pdf.

Zhang, Z.Y. and C.T. Tindle. 1995. Improved equivalent fluid approximations for a low shear speed ocean bottom. *Journal of the Acoustical Society of America* 98(6): 3391-3396. https://doi.org/10.1121/1.413789.

Ziolkowski, A.M. 1970. A method for calculating the output pressure waveform from an air gun. *Geophysical Journal International* 21(2): 137-161. https://doi.org/10.1111/j.1365-246X.1970.tb01773.x.

Zykov, M.M. and J.T. MacDonnell. 2013. *Sound Source Characterizations for the Collaborative Baseline Survey Offshore Massachusetts Final Report: Side Scan Sonar, Sub-Bottom Profiler, and the R/V Small Research Vessel experimental*. Document 00413, Version 2.0. Technical report by JASCO Applied Sciences for Fugro GeoServices, Inc. and the (US) Bureau of Ocean Energy Management.

Appendix A. Acoustic Metrics

A.1. Pressure Related Acoustic Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of p_0 = 1 μPa. Because the perceived loudness of sound, especially pulsed sound such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate sound and its effects on marine life. Here we provide specific definitions of relevant metrics used in the accompanying report. Where possible, we follow the American National Standard Institute and International Organization for Standardization definitions and symbols for sound metrics (e.g., ISO 2017, ANSI S1.1-2013), but these standards are not always consistent.

The zero-to-peak sound pressure, or peak sound pressure (PK or $L_{p,pk}$; dB re 1 µPa), is the decibel level of the maximum instantaneous acoustic pressure in a stated frequency band attained by an acoustic pressure signal, $\mathrm{p(t)}$:

$$L_{p,\mathrm{pk}} = 10\log_{10}\frac{\max|p^2(t)|}{p_0^2} = 20\log_{10}\frac{\max|p(t)|}{p_0} \tag{A-1}$$

PK is often included as a criterion for assessing whether a sound is potentially injurious; however, because it does not account for the duration of an acoustic event, it is generally a poor indicator of perceived loudness.

The peak-to-peak sound pressure (PK-PK or $L_{p,pk\text{-}pk}$; dB re 1 µPa) is the difference between the maximum and minimum instantaneous sound pressure, possibly filtered in a stated frequency band, attained by an impulsive sound, $\mathrm{p(t)}$:

$$L_{p,\mathrm{pk\text{-}pk}} = 10\log_{10}\frac{[\max(p(t)) - \min(p(t))]^2}{p_0^2} \tag{A-2}$$

The sound pressure level (SPL or L_p; dB re 1 µPa) is the root-mean-square (rms) pressure level in a stated frequency band over a specified time window (T; s). It is important to note that SPL always refers to an rms pressure level and therefore not instantaneous pressure:

$$L_p = 10\log_{10}\left(\frac{1}{T}\int_T g(t)\,p^2(t)\,dt \Big/ p_0^2\right) \tag{A-3}$$

where $\mathrm{g(t)}$ is an optional time weighting function. In many cases, the start time of the integration is marched forward in small time steps to produce a time-varying SPL function. For short acoustic events, such as sonar pulses and marine mammal vocalizations, it is important to choose an appropriate time window that matches the duration of the signal. For in-air studies, when evaluating the perceived loudness of sounds with rapid amplitude variations in time, the time weighting function $\mathrm{g(t)}$ is often set to a decaying exponential function that emphasizes more recent pressure signals. This function mimics the leaky integration nature of mammalian hearing. For example, human-based fast time-weighted SPL ($L_{p,fast}$) applies an exponential function with time constant 125 ms. A related simpler approach used in underwater acoustics sets $\mathrm{g(t)}$ to a boxcar (unity amplitude) function of width 125 ms; the results can be referred to as $L_{p,boxcar\ 125ms}$. Another approach, historically used to evaluate SPL of impulsive signals underwater, defines $\mathrm{g(t)}$ as a boxcar function with edges set to the times corresponding to 5% and 95% of the cumulative square pressure function encompassing the duration of an impulsive acoustic event. This calculation is applied individually to each impulse signal, and the results are referred to as 90% SPL ($L_{p,90\%}$).

The sound exposure level (SEL or L_E; dB re 1 µPa²·s) is the time-integral of the squared acoustic pressure over a duration (T):

$$L_E = 10\log_{10}\left(\int_T p^2(t)\,dt \Big/ T_0 p_0^2\right) \qquad \text{(A-4)}$$

where T_0 is a reference time interval of 1 s. SEL continues to increase with time when non-zero pressure signals are present. It is a dose-type measurement, so the integration time applied must be carefully considered for its relevance to impact to the exposed recipients.

SEL can be calculated over a fixed duration, such as the time of a single event or a period with multiple acoustic events. When applied to pulsed sounds, SEL can be calculated by summing the SEL of the N individual pulses. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, the SEL can be computed by summing (in linear units) the SEL of the N individual events:

$$L_{E,N} = 10\log_{10}\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}} \qquad \text{(A-5)}$$

If applied, the frequency weighting of an acoustic event should be specified, as in the case of weighted SEL (e.g., $L_{E,LF,24h}$; see Appendix A.3) or auditory-weighted SPL ($L_{p,ht}$). The use of fast, slow, or impulse exponential-time-averaging or other time-related characteristics should also be specified.

A.2. Marine Mammal Impact Criteria

It has been long recognised that marine mammals can be adversely affected by underwater anthropogenic noise. For example, Payne and Webb (1971) suggested that communication distances of fin whales are reduced by shipping sounds. Subsequently, similar concerns arose regarding effects of other underwater noise sources and the possibility that impulsive sources—primarily airguns used in seismic surveys—could cause auditory injury. This led to a series of workshops held in the late 1990s, conducted to address acoustic mitigation requirements for seismic surveys and other underwater noise sources (NMFS 1998, ONR 1998, Nedwell and Turnpenny 1998, HESS 1999, Ellison and Stein 1999). In the years since these early workshops, a variety of thresholds have been proposed for both injury and disturbance. The following sections summarize the recent development of thresholds; however, this field remains an active research topic.

A.2.1. Injury

In recognition of shortcomings of the SPL-only based injury criteria, in 2005 NMFS sponsored the Noise Criteria Group to review literature on marine mammal hearing to propose new noise exposure criteria. Some members of this expert group published a landmark paper (Southall et al. 2007) that suggested assessment methods similar to those applied for humans. The resulting recommendations introduced dual acoustic injury criteria for impulsive sounds that included peak pressure level thresholds and SEL_{24h} thresholds, where the subscripted 24h refers to the accumulation period for calculating SEL. The peak pressure level criterion is not frequency weighted whereas the SEL_{24h} is frequency weighted according to one of four marine mammal species hearing groups: low-, mid- and high-frequency cetaceans (LF, MF, and HF cetaceans, respectively) and Pinnipeds in Water (PINN). These weighting functions are referred to as M-weighting filters (analogous to the A-weighting filter for human; Appendix A.3). The SEL_{24h} thresholds were obtained by extrapolating measurements of onset levels of Temporary Threshold Shift (TTS) in belugas by the amount of TTS required to produce Permanent Threshold Shift (PTS) in chinchillas. The Southall et al. (2007) recommendations do not specify an exchange rate, which suggests that the thresholds are the same regardless of the duration of exposure (i.e., it implies a 3 dB exchange rate).

Wood et al. (2012) refined Southall et al.'s (2007) thresholds, suggesting lower injury values for LF and HF cetaceans while retaining the filter shapes. Their revised thresholds were based on TTS-onset levels in harbour porpoises from Lucke et al. (2009), which led to a revised impulsive sound PTS threshold for HF cetaceans of 179 dB re 1 µPa^2·s. Because there were no data available for baleen whales, Wood et al. (2012) based their recommendations for LF cetaceans on results obtained from MF cetacean studies. In particular they referenced Finneran and Schlundt (2010) research, which found mid-frequency cetaceans are more sensitive to non-impulsive sound exposure than Southall et al. (2007) assumed. Wood et al. (2012) thus recommended a more conservative TTS-onset level for LF cetaceans of 192 dB re 1 µPa^2·s.

As of present an optimal approach is not apparent. There is consensus in the research community that an SEL-based method is preferable either separately or in addition to an SPL-based approach to assess the potential for injuries. In August 2016, after substantial public and expert input into three draft versions and based largely on the above-mentioned literature (NOAA 2013, 2015, 2016), NMFS finalised technical guidance for assessing the effect of anthropogenic sound on marine mammal hearing (NMFS 2016). The guidance describes injury criteria with new thresholds and frequency weighting functions for the five hearing groups described by Finneran and Jenkins (2012). The latest revision to this work was published in 2018; with the criteria defined in NMFS (2018). The latest criteria are from Southall et al. (2019) which is applied in this report.

A.2.2. Behavioural response

Numerous studies on marine mammal behavioural responses to sound exposure have not resulted in consensus in the scientific community regarding the appropriate metric for assessing behavioural reactions. However, it is recognised that the context in which the sound is received affects the nature and extent of responses to a stimulus (Southall et al. 2007, Ellison and Frankel 2012, Southall et al. 2016).

For impulsive noise, NMFS currently uses step function thresholds of 160 dB re 1 µPa SPL (unweighted) to assess and regulate noise-induced behavioural impacts for marine mammals (NOAA 2018, NOAA 2019). The threshold for impulsive sound is derived from the High-Energy Seismic Survey (HESS) panel (HESS 1999) report that, in turn, is based on the responses of migrating mysticete whales to airgun sounds (Malme et al. 1984). The HESS team recognised that behavioural responses to sound may occur at lower levels, but significant responses were only likely to occur above a SPL of 140 dB re 1 µPa. Southall et al. (2007) found varying responses for most marine mammals between a SPL of 140 and 180 dB re 1 µPa, consistent with the HESS (1999) report, but lack of convergence in the data prevented them from suggesting explicit step functions.

A.3. Marine Mammal Frequency Weighting

The potential for noise to affect animals depends on how well the animals can hear it. Noises are less likely to disturb or injure an animal if they are at frequencies that the animal cannot hear well. An exception occurs when the sound pressure is so high that it can physically injure an animal by non-auditory means (i.e., barotrauma). For sound levels below such extremes, the importance of sound components at particular frequencies can be scaled by frequency weighting relevant to an animal's sensitivity to those frequencies (Nedwell and Turnpenny 1998, Nedwell et al. 2007).

A.3.1. Marine Mammal Frequency Weighting Functions

In 2015, a US Navy technical report by Finneran (2015) recommended new auditory weighting functions. The overall shape of the auditory weighting functions is similar to human A-weighting functions, which follows the sensitivity of the human ear at low sound levels. The new frequency-weighting function is expressed as:

$$G(f) = K + 10\log_{10}\left[\left(\frac{(f/f_{lo})^{2a}}{\left[1+(f/f_{lo})^2\right]^a\left[1+(f/f_{hi})^2\right]^b}\right)\right] \quad \text{(A-6)}$$

Finneran (2015) proposed five functional hearing groups for marine mammals in water: low-, mid- and high-frequency cetaceans (LF, MF, and HF cetaceans, respectively), phocid pinnipeds, and otariid pinnipeds. The parameters for these frequency-weighting functions were further modified the following year (Finneran 2016) and were adopted in NOAA's technical guidance that assesses acoustic impacts on marine mammals (NMFS 2018), and in the latest guidance by Southall (2019). The updates did not affect the content related to either the definitions of frequency-weighting functions or the threshold values. Table A-1 lists the frequency-weighting parameters for each hearing group. Figure A-1 shows the resulting frequency-weighting curves.

Table A-1. Parameters for the auditory weighting functions used in this project as recommended by Southall et al. (2019).

Hearing group	a	b	f_{lo} (Hz)	f_{hi} (kHz)	K (dB)
Low-frequency cetaceans (baleen whales)	1.0	2	200	19,000	0.13
High-frequency cetaceans (dolphins, plus toothed, beaked, and bottlenose whales)	1.6	2	8,800	110,000	1.20
Very-high-frequency cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* and *L. australis*)	1.8	2	12,000	140,000	1.36
Phocid seals in water	1.0	2	1,900	30,000	0.75
Otariid seals in water	2.0	2	940	25,000	0.64

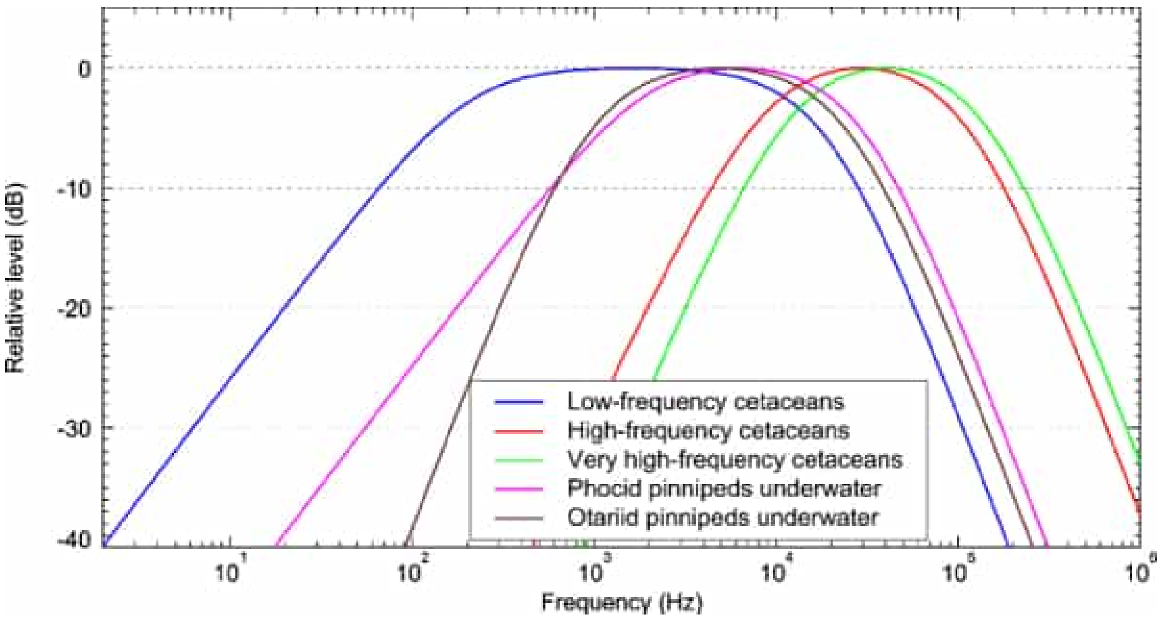


Figure A-1. Auditory weighting functions for functional marine mammal hearing groups used in this project as recommended by Southall et al. (2019).

Appendix B. Acoustic Source Model

B.1. Airgun Array Source Model

The source levels and directivity of the seismic source were predicted with JASCO's Airgun Array Source Model (AASM). AASM includes low- and high-frequency modules for predicting different components of the seismic source spectrum. The low-frequency module is based on the physics of oscillation and radiation of airgun bubbles, as originally described by Ziolkowski (1970), that solves the set of parallel differential equations that govern bubble oscillations. Physical effects accounted for in the simulation include pressure interactions between airguns, port throttling, bubble damping, and generator-injector (GI) gun behaviour discussed by Dragoset (1984), Laws et al. (1990), and Landrø (1992). A global optimisation algorithm tunes free parameters in the model to a large library of airgun source signatures.

While airgun signatures are highly repeatable at the low frequencies, which are used for seismic imaging, their sound emissions have a large random component at higher frequencies that cannot be predicted using a deterministic model. Therefore, AASM uses a stochastic simulation to predict the high-frequency (800−25,000 Hz) sound emissions of individual airguns, using a data-driven multiple-regression model. The multiple-regression model is based on a statistical analysis of a large collection of high quality seismic source signature data recently obtained from the Joint Industry Program (JIP) on Sound and Marine Life (Mattsson and Jenkerson 2008). The stochastic model uses a Monte-Carlo simulation to simulate the random component of the high-frequency spectrum of each airgun in an array. The mean high-frequency spectra from the stochastic model augment the low-frequency signatures from the physical model, allowing AASM to predict airgun source levels at frequencies up to 25,000 Hz.

AASM produces a set of "notional" signatures for each array element based on:

- Array layout
- Volume, tow depth, and firing pressure of each airgun
- Interactions between different airguns in the array

These notional signatures are the pressure waveforms of the individual airguns at a standard reference distance of 1 m; they account for the interactions with the other airguns in the array. The signatures are summed with the appropriate phase delays to obtain the far-field source signature of the entire array in all directions. This far-field array signature is filtered into decidecade-bands to compute the source levels of the array as a function of frequency band and azimuthal angle in the horizontal plane (at the source depth), after which it is considered a directional point source in the far field.

A seismic array consists of many sources and the point source assumption is invalid in the near field where the array elements add incoherently. The maximum extent of the near field of an array (R_{nf}) is:

$$R_{\mathrm{nf}} < \frac{l^2}{4\lambda} \tag{B-1}$$

where λ is the sound wavelength and l is the longest dimension of the array (Lurton 2002, §5.2.4). For example, a seismic source length of l = 21 m yields a near-field range of 147 m at 2 kHz and 7 m at 100 Hz. Beyond this R_{nf} range, the array is assumed to radiate like a directional point source and is treated as such for propagation modelling.

The interactions between individual elements of the array create directionality in the overall acoustic emission. Generally, this directionality is prominent mainly at frequencies in the mid-range between tens of hertz to several hundred hertz. At lower frequencies, with acoustic wavelengths much larger than the inter-airgun separation distances, the directionality is small. At higher frequencies, the pattern of lobes is too finely spaced to be resolved and the effective directivity is less.

B.2. Seismic Source

The layout of the triple 3480 in^3 seismic source used for modelling in this study is provided in Figure B-1 with details of the airgun parameters are provided in Table B-1.

For the modelled array, the layout is presented in a nominal cartesian coordinate system. In this coordinate system the direction of vessel travel determines the relative position of the array elements as plotted and tabulated. The layout used for acoustic modelling was produced by transforming the coordinates of client supplied layouts such that the resultant layouts correspond to a vessel travel direction along the positive X-axis and the array is centred on the X-Y origin. When used with an acoustic model the positive X-axis in this nominal coordinate system aligns with the vessel tow direction or survey line azimuth.

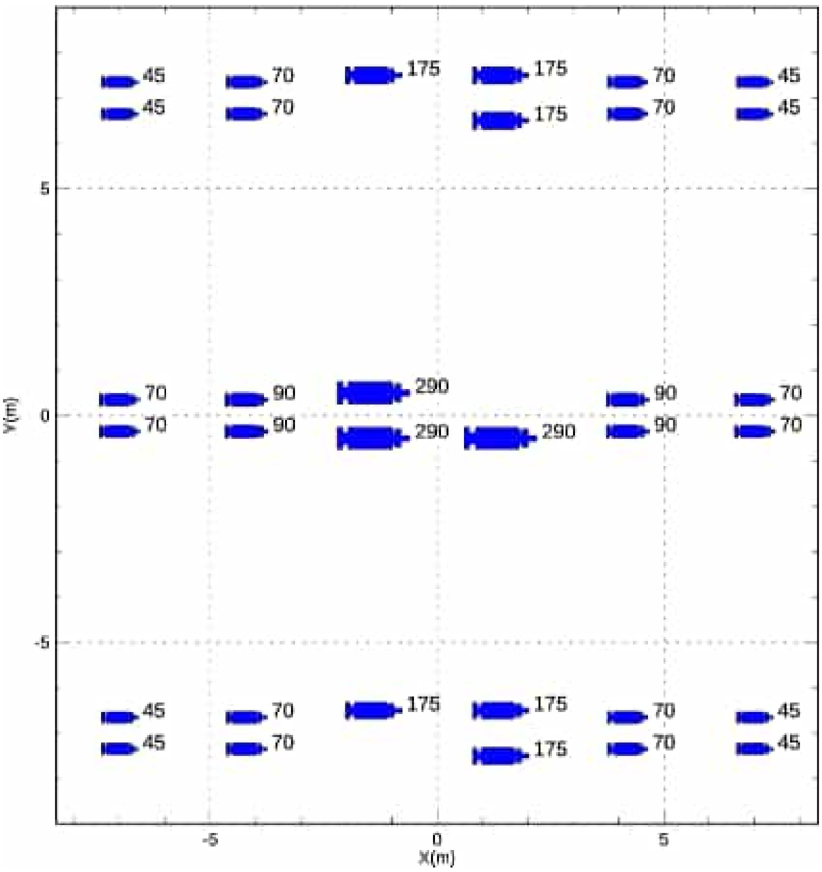


Figure B-1. Layout of the modelled triple 3480 in^3 seismic source where the plotted layout is such that the array is centred on the origin and vessel travel direction is in the positive x-direction. Tow depth is 7 m. The labels indicate the firing volume (in cubic inches) for each airgun. Also see Table B-1.

Table B-1. Layout of the modelled triple 3480 in^3 seismic source. Tow depth was 7 m. Firing pressure for all guns was 2000 psi. Also see Figure B-1. Greyed out values indicate spares.

String	Gun	x (m)	y (m)	z (m)	Vol. (in^3)
1	1	7.0	-7.35	7	45
	2	7.0	-6.65	7	45
	3	4.2	-7.35	7	70
	4	4.2	-6.65	7	70
	5	1.4	-7.5	7	175
	6	1.4	-6.5	7	175
	7	-1.4	-7.5	7	175
	8	-1.4	-6.5	7	175
	9	-4.2	-7.35	7	70
	10	-4.2	-6.65	7	70
	11	-7.0	-7.35	7	45
	12	-7.0	-6.65	7	45

String	Gun	x (m)	y (m)	z (m)	Vol. (in^3)
2	1	7.0	-0.35	7	70
	2	7.0	0.35	7	70
	3	4.2	-0.35	7	90
	4	4.2	0.35	7	90
	5	1.4	-0.5	7	290
	6	1.4	0.5	7	290
	7	-1.4	-0.5	7	290
	8	-1.4	0.5	7	290
	9	-4.2	-0.35	7	90
	10	-4.2	0.35	7	90
	11	-7.0	-0.35	7	70
	12	-7.0	0.35	7	70

String	Gun	x (m)	y (m)	z (m)	Vol. (in^3)
3	1	7.0	7.35	7	45
	2	7.0	6.65	7	45
	3	4.2	7.35	7	70
	4	4.2	6.65	7	70
	5	1.4	7.5	7	175
	6	1.4	6.5	7	175
	7	-1.4	7.5	7	175
	8	-1.4	6.5	7	175
	9	-4.2	7.35	7	70
	10	-4.2	6.65	7	70
	11	-7.0	7.35	7	45
	12	-7.0	6.65	7	45

B.3. Array Source Levels and Directivity

Figure B-2 shows the broadside (perpendicular to the tow direction), endfire (parallel to the tow direction) and vertical overpressure signature and corresponding power spectrum levels for the triple 3480 in^3 array (Appendix B.2). Horizontal decidecade-band source levels are shown as a function of band centre frequency and azimuth in Figure B-3.

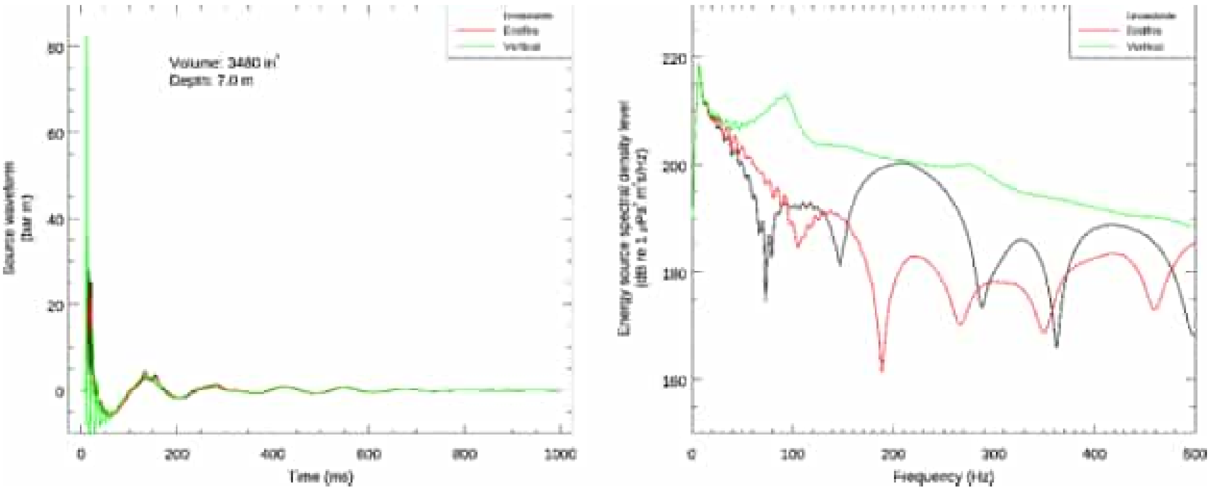


Figure B-2. Predicted source level details for the triple 3480 in^3 array at 7 m towed depth. (Left) the overpressure signature and (right) the power spectrum for in-plane horizontal (broadside), perpendicular (endfire), and vertical directions (no surface ghost).

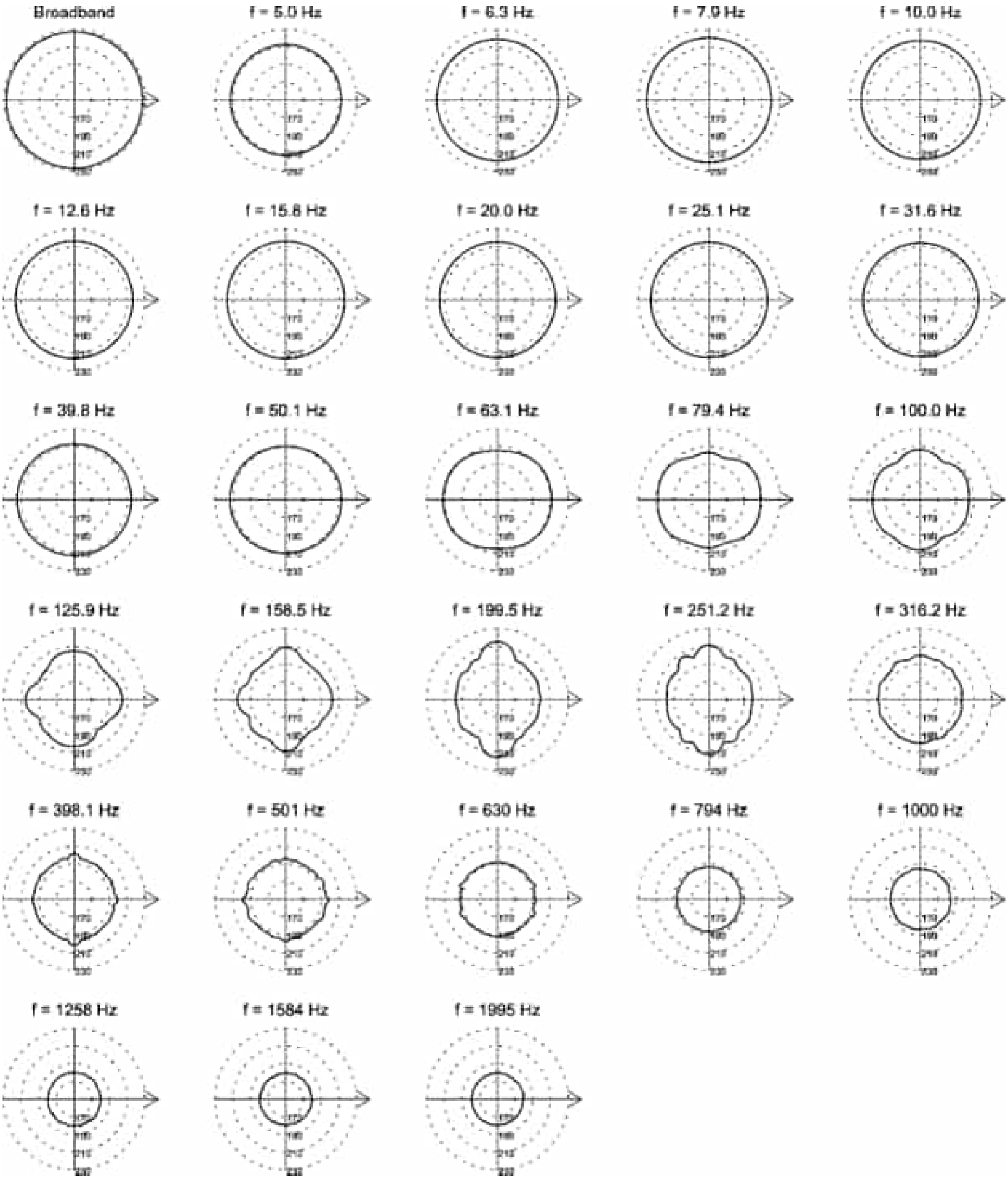


Figure B-3. Directionality of the predicted horizontal source levels for the triple 3480 in^3 seismic source, 5 Hz to 2 kHz. Source levels (in dB re 1 µPa^2·s m^2) are shown as a function of azimuth for the centre frequencies of the decidecade bands modelled; frequencies are shown above the plots. The perpendicular direction to the frame is to the right. Tow depth is 7 m (see Table B-1).

Appendix C. Sound Propagation Models

C.1. MONM-BELLHOP

Long-range sound fields were computed using JASCO's Marine Operations Noise Model (MONM). Compared to VSTACK (Appendix C.3), MONM less accurately predicts steep-angle propagation for environments with higher shear speed but is well suited for effective longer-range estimation. This model computes sound propagation at frequencies of 5 Hz to 1 kHz via a wide-angle parabolic equation solution to the acoustic wave equation (Collins 1993) based on a version of the US Naval Research Laboratory's Range-dependent Acoustic Model (RAM), which has been modified to account for a solid seabed (Zhang and Tindle 1995). MONM computes sound propagation at frequencies >1 kHz via the BELLHOP Gaussian beam acoustic ray-trace model (Porter and Liu 1994).

The parabolic equation method has been extensively benchmarked and is widely employed in the underwater acoustics community (Collins et al. 1996). MONM accounts for the additional reflection loss at the seabed, which results from partial conversion of incident compressional waves to shear waves at the seabed and sub-bottom interfaces, and it includes wave attenuations in all layers. MONM incorporates the following site-specific environmental properties: a bathymetric grid of the modelled area, underwater sound speed as a function of depth, and a geoacoustic profile based on the overall stratified composition of the seafloor.

This version of MONM accounts for sound attenuation due to energy absorption through ion relaxation and viscosity of water in addition to acoustic attenuation due to reflection at the medium boundaries and internal layers (Fisher and Simmons 1977). The former type of sound attenuation is significant for frequencies higher than 5 kHz and cannot be neglected without noticeably affecting the model results.

MONM computes acoustic fields in three dimensions by modelling transmission loss within two-dimensional (2-D) vertical planes aligned along radials covering a 360° swath from the source, an approach commonly referred to as N×2-D. These vertical radial planes are separated by an angular step size of $\Delta\theta$, yielding N = 360°/$\Delta\theta$ number of planes (Figure C-1).

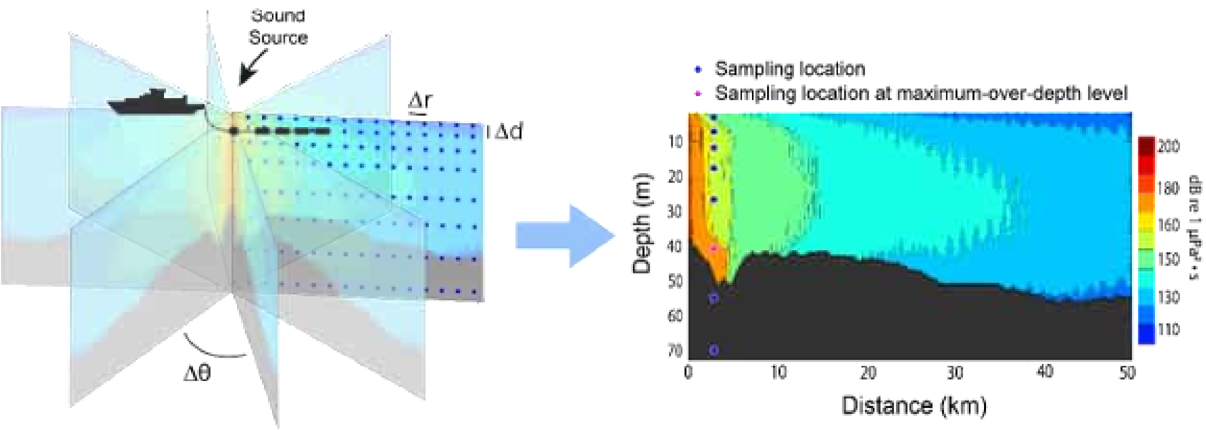


Figure C-1. The N×2-D and maximum-over-depth modelling approach used by MONM.

MONM treats frequency dependence by computing acoustic transmission loss at the centre frequencies of decidecade bands. Sufficiently many decidecade bands, starting at 5 Hz, are modelled to include most of the acoustic energy emitted by the source. At each centre frequency, the transmission loss is modelled within each of the N vertical planes as a function of depth and range from the source. The decidecade band received per-pulse SEL are computed by subtracting the band transmission loss values from the directional source level in that frequency band. Composite broadband received per-pulse SEL are then computed by summing the received decidecade band levels.

The received per-pulse SEL sound field within each vertical radial plane is sampled at various ranges from the source, generally with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The step sizes are chosen to provide increased coverage near the depth of the source and at depths of interest in terms of the sound speed profile. The maximum received per-pulse SEL at many sampling depths are taken over all samples within the water column, i.e., the maximum-over-depth received per-pulse SEL. These maximum-over-depth per-pulse SEL are presented as contours around the source.

C.2. Full Waveform Range-dependent Acoustic Model: FWRAM

For impulsive sounds from the seismic source, time-domain representations of the pressure waves generated in the water are required to calculate SPL and PK. Furthermore, the seismic source must be represented as a distributed source to accurately characterise vertical directivity effects in the near-field zone. For this study, synthetic pressure waveforms were computed using FWRAM, which is a time-domain acoustic model based on the same wide-angle parabolic equation (PE) algorithm as MONM. FWRAM computes synthetic pressure waveforms versus range and depth for range-varying marine acoustic environments, and it takes the same environmental inputs as MONM (bathymetry, water sound speed profile, and seafloor geoacoustic profile). Unlike MONM, FWRAM computes pressure waveforms via Fourier synthesis of the modelled acoustic transfer function in closely spaced frequency bands. FWRAM employs the array starter method to accurately model sound propagation from a spatially distributed source (MacGillivray and Chapman 2012).

Besides providing direct calculations of the PK and SPL, the synthetic waveforms from FWRAM can also be used to convert the SEL values from MONM to SPL.

C.3. Wavenumber Integration Model

Sound pressure levels near the seismic source were modelled using JASCO's VSTACK wavenumber integration model. VSTACK computes synthetic pressure waveforms versus depth and range for arbitrarily layered, range-independent acoustic environments using the wavenumber integration approach to solve the exact (range-independent) acoustic wave equation. This model is valid over the full angular range of the wave equation and can fully account for the elasto-acoustic properties of the sub-bottom. Wavenumber integration methods are extensively used in the field of underwater acoustics and seismology where they are often referred to as reflectivity methods or discrete wavenumber methods. VSTACK computes sound propagation in arbitrarily stratified water and seabed layers by decomposing the outgoing field into a continuum of outward-propagating plane cylindrical waves. Seabed reflectivity in the model is dependent on the seabed layer properties: compressional and shear wave speeds, attenuation coefficients, and layer densities. The output of the model can be post-processed to yield estimates of the SEL, SPL, and PK.

VSTACK accurately predicts steep-angle propagation in the proximity of the source, but it is computationally slow at predicting sound pressures at large distances due to the need for smaller wavenumber steps with increasing distance. Additionally, VSTACK assumes range-invariant bathymetry with a horizontally stratified medium (i.e., a range-independent environment) which is azimuthally symmetric about the source. VSTACK is thus best suited to modelling the sound field near the source.

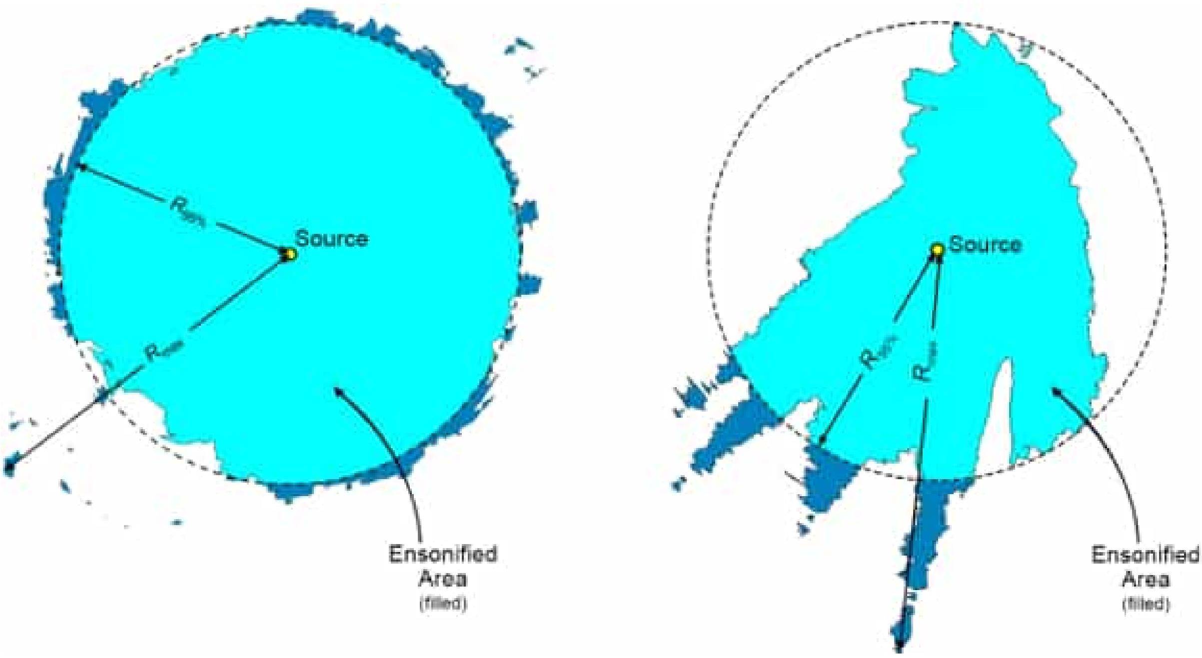
Appendix D. Methods and Parameters

This section details the environmental parameters used in the propagation models.

D.1. Estimating Range to Thresholds Levels

Sound level contours were calculated based on the underwater sound fields predicted by the propagation models, sampled by taking the maximum value over all modelled depths above the seafloor for each location in the modelled region. The predicted distances to specific levels were computed from these contours. Two distances relative to the source are reported for each sound level: 1) R_{max}, the maximum range to the given sound level over all azimuths, and 2) $R_{95\%}$, the range to the given sound level after the 5% farthest points were excluded (see examples in Figure D-1).

The $R_{95\%}$ is used because sound field footprints are often irregular in shape. In some cases, a sound level contour might have small protrusions or anomalous isolated fringes. This is demonstrated in the image in Figure D-1(a). In cases such as this, where relatively few points are excluded in any given direction, R_{max} can misrepresent the area of the region exposed to such effects, and $R_{95\%}$ is considered more representative. In strongly asymmetric cases such as shown in Figure D-1(b), on the other hand, $R_{95\%}$ neglects to account for significant protrusions in the footprint. In such cases R_{max} might better represent the region of effect in specific directions. Cases such as this are usually associated with bathymetric features affecting propagation. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment.



(a) (b)

Figure D-1. Sample areas ensonified to an arbitrary sound level with R_{max} and $R_{95\%}$ ranges shown for two scenarios. (a) Largely symmetric sound level contour with small protrusions. (b) Strongly asymmetric sound level contour with long protrusions. Light blue indicates the ensonified areas bounded by $R_{95\%}$; darker blue indicates the areas outside this boundary which determine R_{max}.

D.2. Estimating SPL from Modelled SEL Results

The per-pulse SEL of sound pulses is an energy-like metric related to the dose of sound received over a pulse's entire duration. The pulse SPL on the other hand, is related to its intensity over a specified time interval. Seismic pulses typically lengthen in duration as they propagate away from their source, due to seafloor and surface reflections, and other waveguide dispersion effects. The changes in pulse length, and therefore the time window considered, affect the numeric relationship between SPL and SEL. This study has applied a fixed window duration to calculate SPL (T_{fix} = 125 ms; see Appendix A.1), as implemented in Martin et al. (2017b). Full-waveform modelling was used to estimate SPL, but this type of modelling is computationally intensive, and can be prohibitively time consuming when run at high spatial resolution over large areas.

For the current study, FWRAM (Appendix C.2) was used to model synthetic seismic pulses over the frequency range 5–1024 Hz. This was performed along all broadside and endfire radials at three sites per Area, plus all Standalone Sites. FWRAM uses Fourier synthesis to recreate the signal in the time domain so that both the SEL and SPL from the source can be calculated. The differences between the SEL and SPL were extracted for all ranges and depths that corresponded to those generated from the high spatial-resolution results from MONM. A 125 ms fixed time window positioned to maximize the SPL over the pulse duration was applied. The resulting SEL-to-SPL offsets were averaged in 0.02 km range bins along each modelled radial and depth, and the 90th percentile was selected at each range to generate a generalised range-dependent conversion function for each site. The range-dependent conversion function was applied to predicted per-pulse SEL results from MONM to model SPL values. Figures D-2 to D-13 show the conversion offsets for several sites for the 3480 in^3 array; the spatial variation is caused by changes in the received airgun pulse as it propagates from the source. The conversion to SPL from SEL was conducted considering the water depth and seabed geology at a given modelled site.

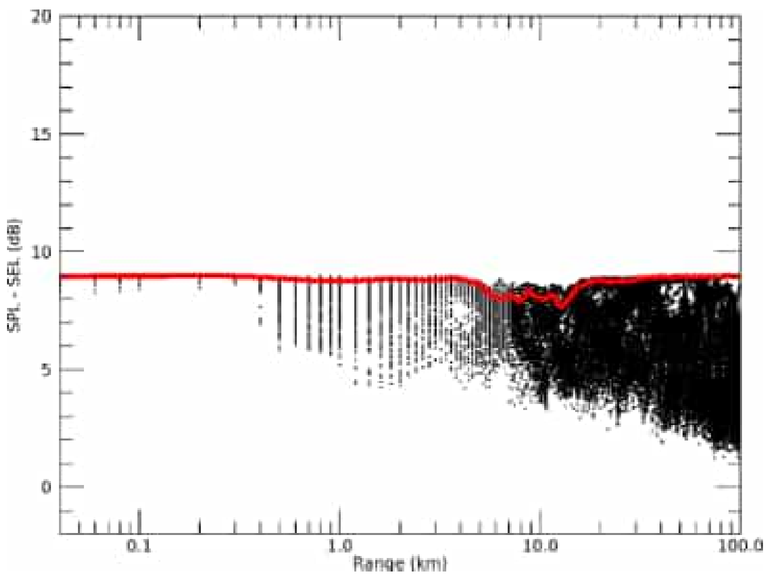


Figure D-2. *Area 1, Site 1, 3480 in^3 seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

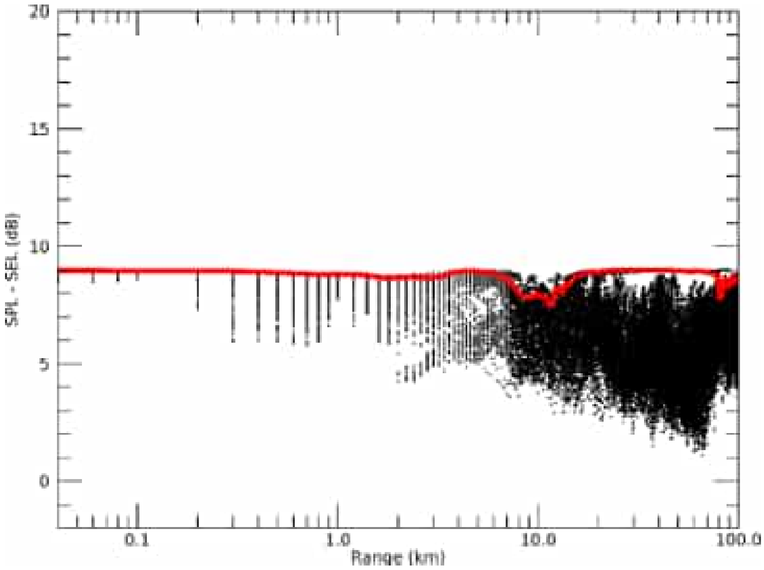


Figure D-3. *Area 1, Site 4, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

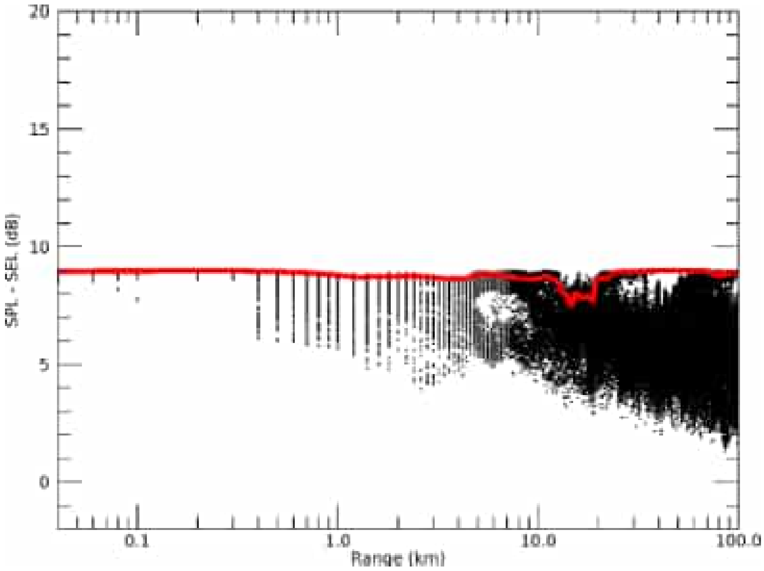


Figure D-4. *Area 1, Site 5, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

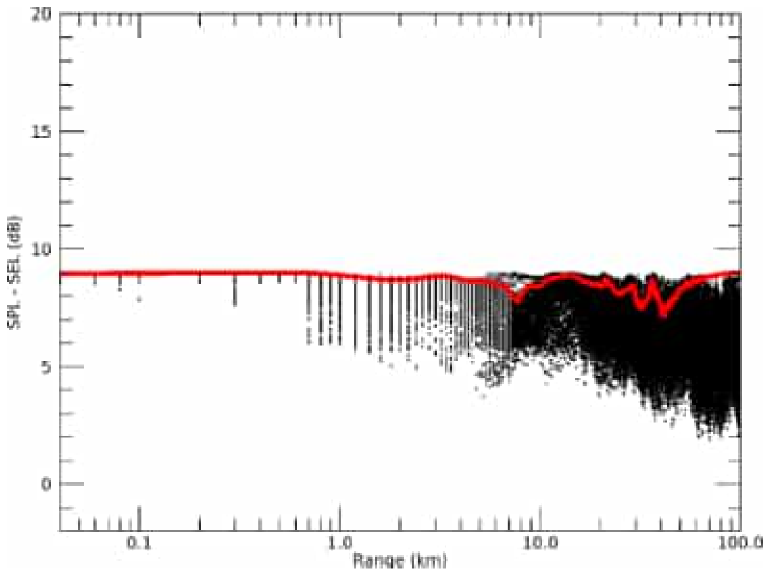


Figure D-5. *Area 2, Site 1, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

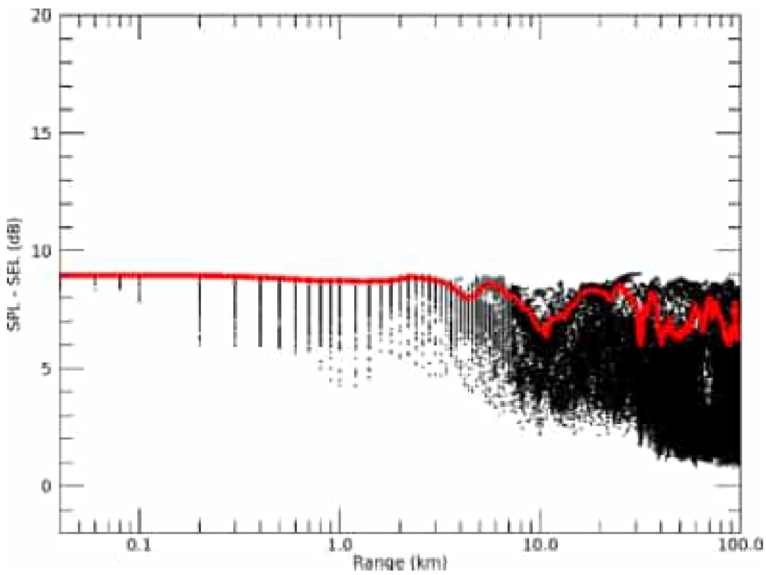


Figure D-6. *Area 3, Site 1, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

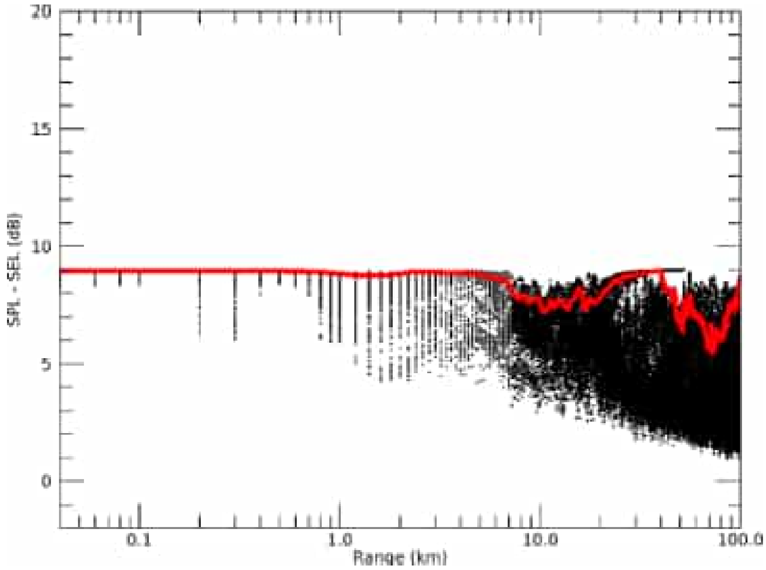


Figure D-7. *Area 3, Site 3, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

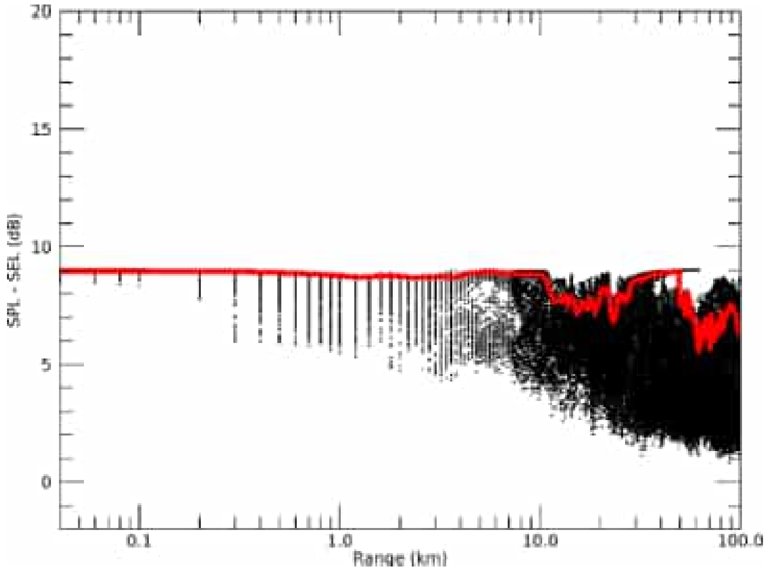


Figure D-8. *Area 3, Site 6, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

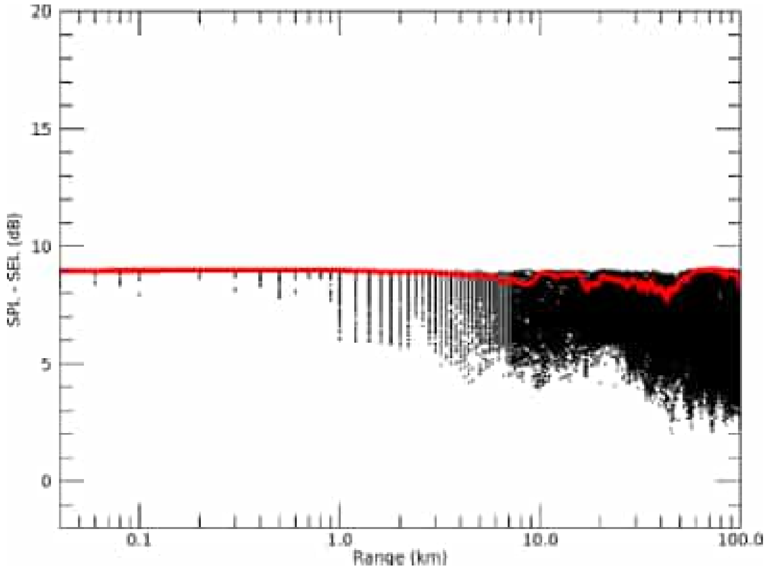


Figure D-9. *Standalone Site 1, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

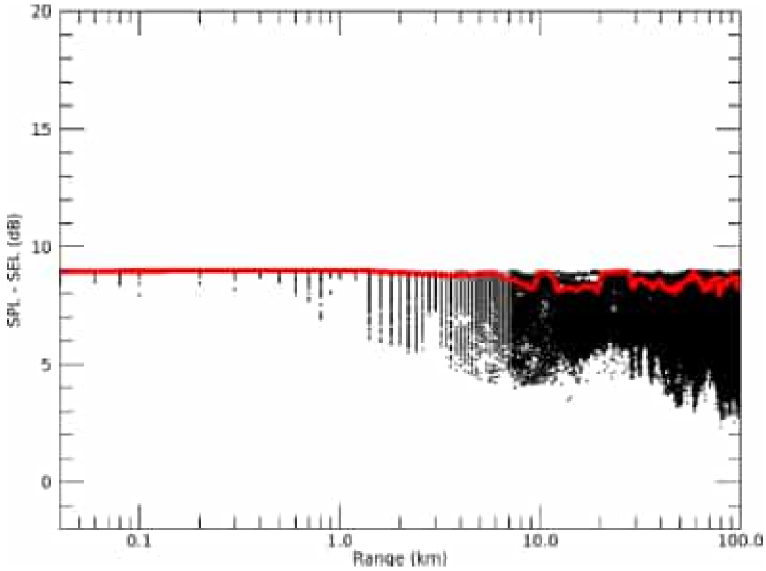


Figure D-10. *Standalone Site 2, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

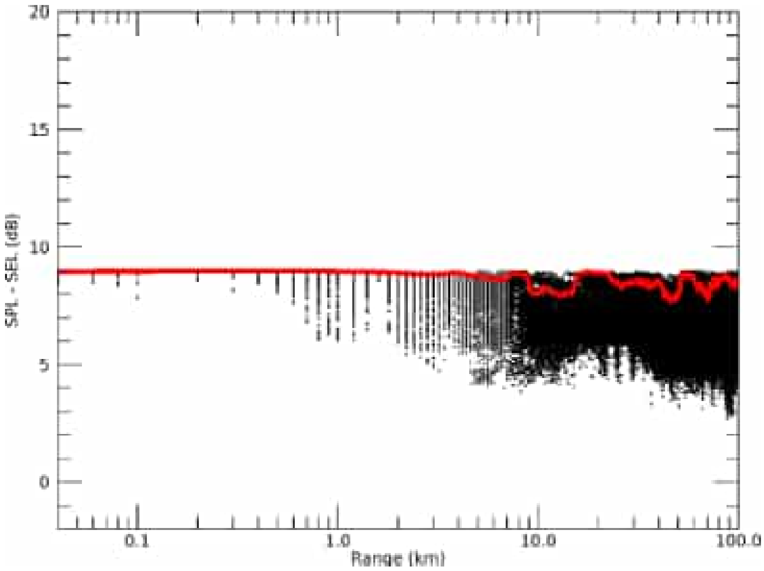


Figure D-11. *Standalone Site 3, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

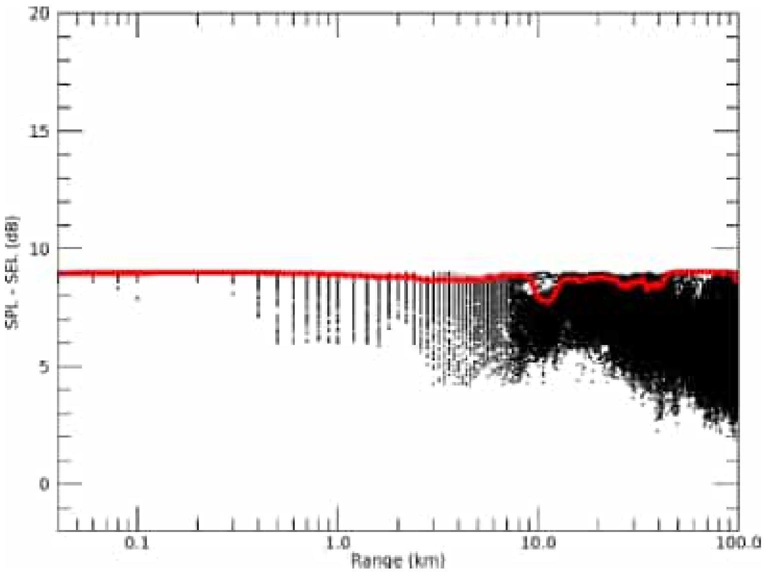


Figure D-12. *Standalone Site 4, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

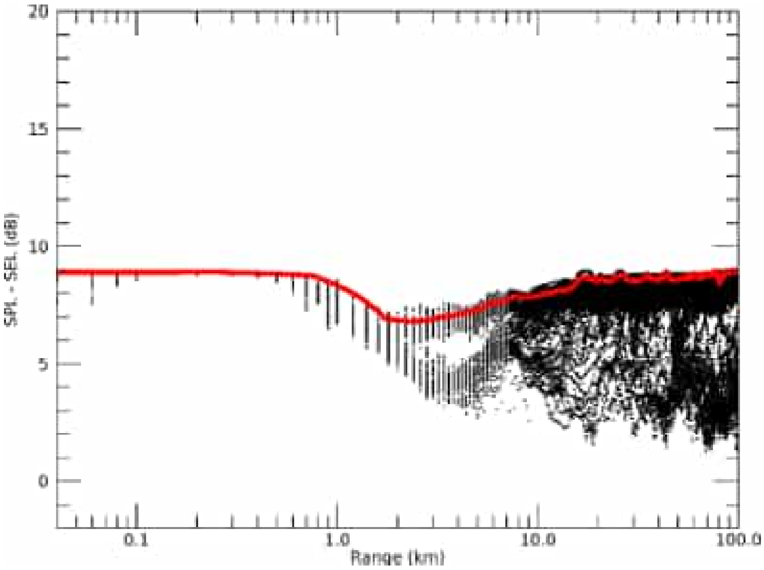


Figure D-13. *Standalone Site 5, 3480 in³ seismic source*: Range-and-depth-dependent conversion offsets for converting sound exposure level (SEL) to sound pressure level (SPL) for seismic pulses. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

D.3. Environmental Parameters

D.3.1. Bathymetry

Water depths throughout the modelled area were extracted from Australian Bathymetry and Topography Grid, a 9 arc-second grid rendered for Australian waters (Whiteway 2009). Bathymetry data was extracted and re-gridded onto a Map Grid of Australia (MGA) coordinate projection (Zone 51) with a regular grid spacing of 250 × 250 m to generate the bathymetry in Figure D-14.

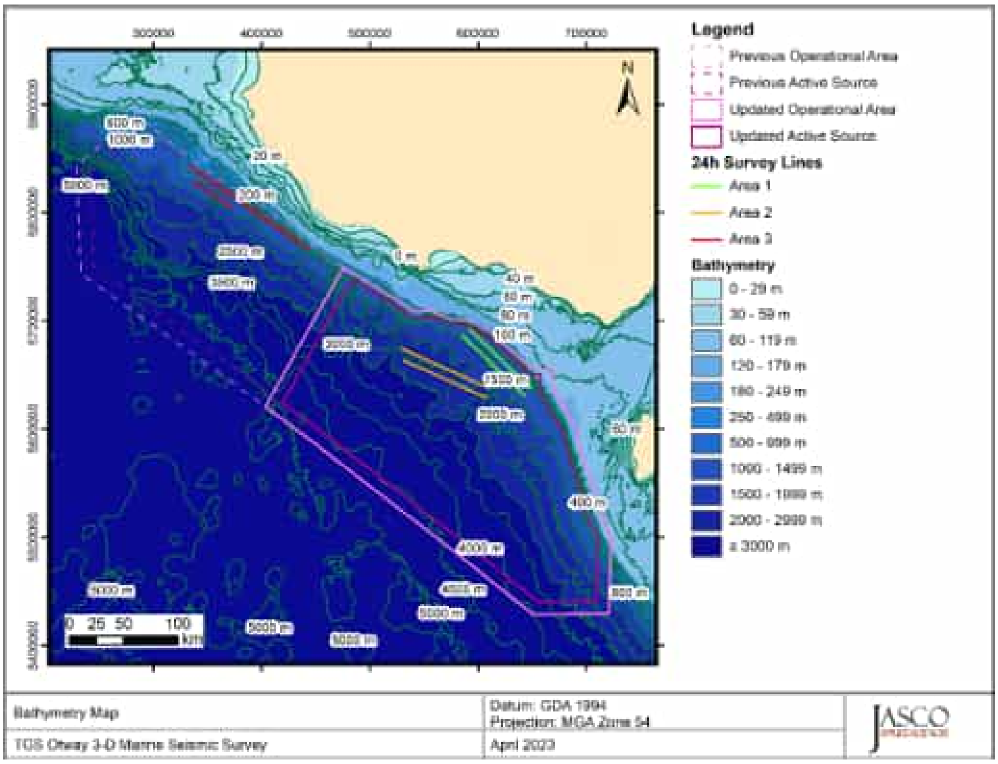


Figure D-14. Bathymetry map of the modelling region for the TGS Otway three-dimensional (3-D) Marine Seismic Survey (MSS).

D.3.2. Sound speed profile

The sound speed profiles for the modelled sites were derived from temperature and salinity profiles from the US Naval Oceanographic Office's Generalized Digital Environmental Model V 3.0 (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world's oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based on global historical observations from the US Navy's Master Oceanographic Observational Data Set (MOODS). The climatology profiles include 78 fixed depth points to a maximum depth of 6800 m (where the ocean is that deep). The GDEM temperature-salinity profiles were converted to sound speed profiles according to Coppens (1981).

Mean monthly sound speed profiles were derived from the GDEM profiles within a 100 km box radius encompassing each of the three areas. To determine the sound speed profile that is expected to be most favourable to longer-range sound propagation during the proposed survey time frame, each month was modelled for each area and the ranges were compared. As such, September was selected for sound propagation modelling to ensure precautionary estimates of distances to received sound level thresholds. Figures D-15 to D-17 show the resulting profiles used as input to the sound propagation modelling.

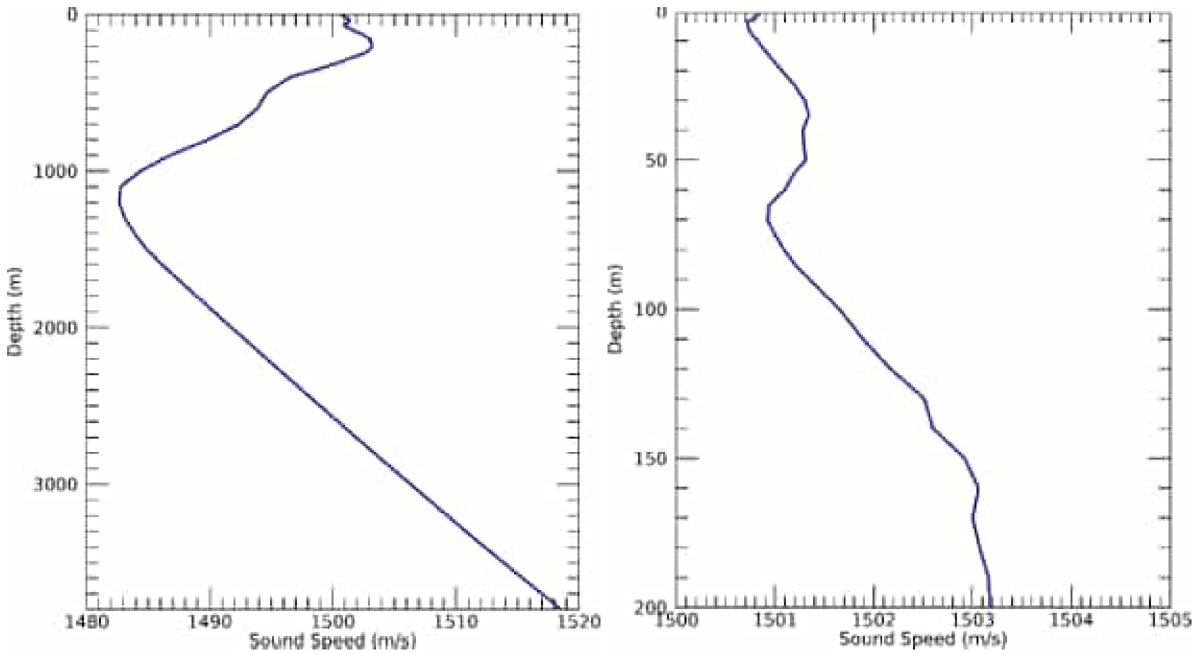


Figure D-15. *Area 1:* The sound speed profile (September) used for the modelling (also used for 2D tie-line sites) showing the entire water column (left) and the top 200 m within the profile (right). Profiles are calculated from temperature and salinity profiles from GDEM V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

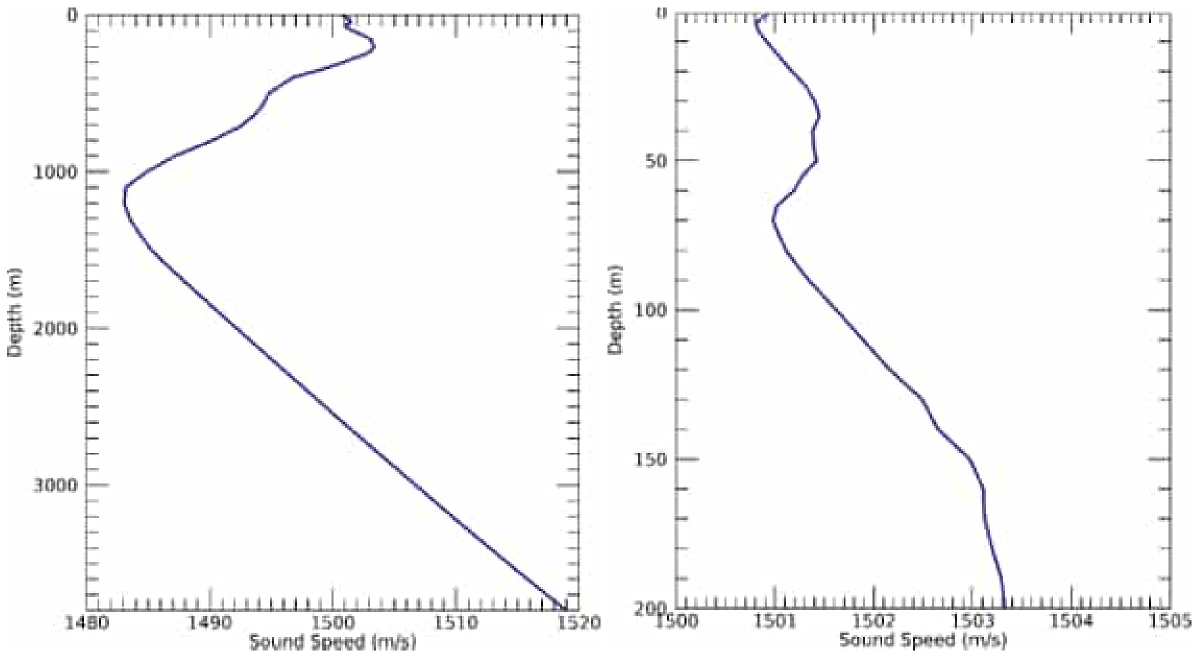


Figure D-16. *Area 2:* The sound speed profile (September) used for the modelling showing the entire water column (left) and the top 200 m within the profile (right). Profiles are calculated from temperature and salinity profiles from GDEM V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

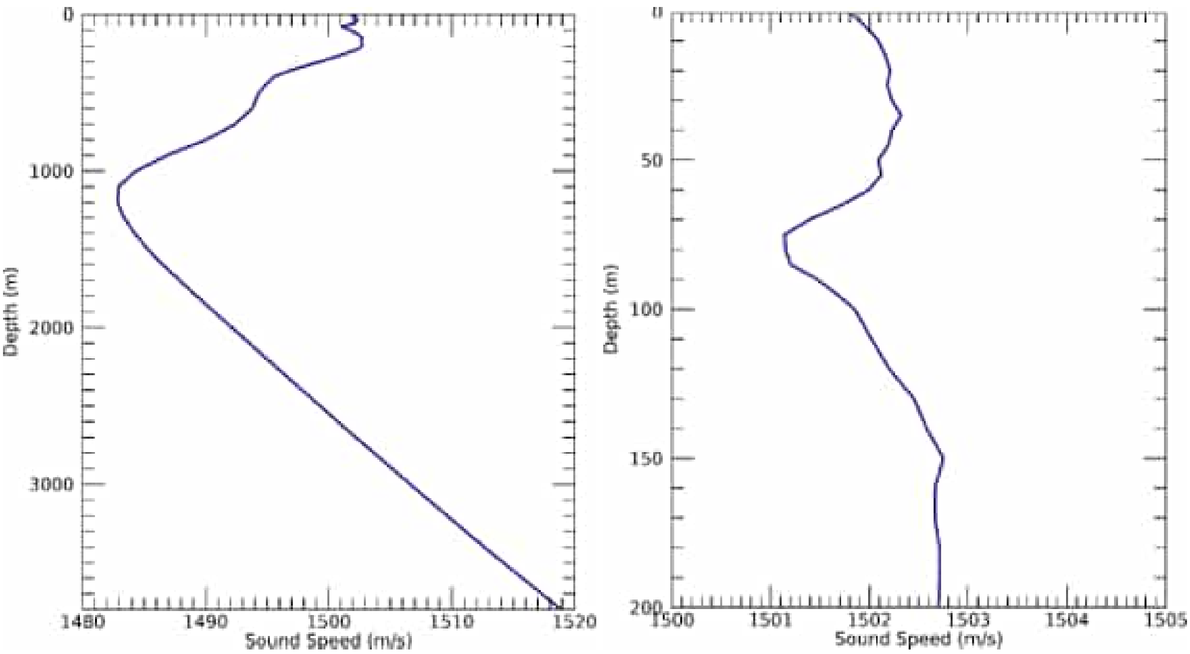


Figure D-17. *Area 3:* The sound speed profile (September) used for the modelling showing the entire water column (left) and the top 200 m within the profile (right). Profiles are calculated from temperature and salinity profiles from GDEM V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

D.3.3. Geoacoustics

Due to the size of the Acquisition Area, the seafloor geology varies greatly necessitating three sets of geoacoustic parameters which were derived based on site locations. There are three general segments to the geology – continental shelf, deep and slope between the two. For details on the geoacoustic profiles see Appendices D.3.3.1 to D.3.3.3.

D.3.3.1. Slope – Areas 1 and 3, TL01, and TL02

Geoacoustic parameters used for modelling at all sites within Areas 1 and 3 were derived from sedimentary grain size measurements from the Australian Government's Marine Sediments (MARS) database (Heap 2009). On average, the surficial grain size indicates silty sand is present throughout the modelled area. Representative grain sizes were used in the grain-shearing model proposed by Buckingham (2005) to estimate the geoacoustic parameters required by the sound propagation models. Table D-1 lists the geoacoustic parameters used for modelling for Areas 1 and 3 and the two representative 2D tie-line sites (TL01 and TL02).

Table D-1. Geoacoustic profile for Areas 1 and 3, TL01, and TL02 – slope.

Depth below seafloor (m)	Predicted lithology	Density (g/cm^3)	Compressional wave		Shear wave	
			Speed (m/s)	Attenuation (dB/λ)	Speed (m/s)	Attenuation (dB/λ)
0–10	Silty carbonate sand to semi-cemented limestone	1.88	1605–1700	0.35–0.70	255	3.65
10–20		1.88–1.89	1700–1755	0.70–0.85		
20–50		1.89–1.90	1755–1850	0.85–1.15		
50–100		1.90–1.92	1850–1950	1.15–1.35		
100–200		1.92–1.96	1950–2100	1.35–1.60		
200–500		1.96–2.05	2100–2355	1.60–1.95		
>500		2.05	2355	1.95		

D.3.3.2. Deep Profile – Area 2, and Standalone Sites 1–4

Geoacoustic parameters used in acoustic transmission loss modelling for the deeper sites (deep-deep) were derived from sedimentary grain size measurements from the Australian Government's Marine Sediments (MARS) database (Heap 2009). Most of these samples were taken on or near the seafloor, although some are from sediment at greater depths. On average, the surficial grain size indicates clayey sand is present throughout the modelled area. As depth increases past ~200 m the sediment becomes lithified based on core logs from an IODP borehole (Feary 2000).

Representative grain sizes and porosity vary with depth following Athy (1930) and were used in the grain-shearing model proposed by Buckingham (2005) to estimate the geoacoustic parameters required by the sound propagation models.

Table D-2. Geoacoustic profile for Area 2, and Standalone Sites 1–4, deep, off-shelf.

Depth below seafloor (m)	Predicted lithology	Density (g/cm^3)	Compressional wave		Shear wave	
			Speed (m/s)	Attenuation (dB/λ)	Speed (m/s)	Attenuation (dB/λ)
0–10	Increasingly compacted clayey silt	1.63	1498–1560	0.08–0.36	118	3.65
10–20		1.63–1.64	1560–1582	0.36–0.44		
20–50		1.64–1.66	1582–1623	0.44–0.59		
50–100		1.66–1.68	1623–1667	0.59–0.73		
100–200		1.68–1.73	1667–1727	0.73–0.89		
>200	Lithified clayey silt	1.73	1727	0.89		

D.3.3.3. Off-Shore Continental Shelf – Standalone Site 5

Table D-3. Geoacoustic profile for Standalone Site 5 – off-shore continental shelf.

Depth below seafloor (m)	Predicted lithology	Density (g/cm^3)	Compressional wave		Shear wave	
			Speed (m/s)	Attenuation (dB/λ)	Speed (m/s)	Attenuation (dB/λ)
0–1	Well-cemented carbonate caprock	2.7	2600	0.50	500	0.4
1–20	Increasingly cemented calcarenite	2.2–2.3	2000–2120	0.30–0.34		
20–40		2.3–2.4	2120–2240	0.34–0.38		
40–60		2.4–2.5	2240–2360	0.38–0.42		
60–80		2.5–2.6	2360–2480	0.42–0.46		
80–100		2.6–2.7	2480–2600	0.46–0.50		
>100	Well-cemented calcarenite	2.7	2600	0.50		

D.4. Animal Movement and Exposure Modelling

Animal movement and exposure modelling considers the movement of both sound sources (if mobile) and animals over time. Acoustic source and propagation modelling are used to generate 3-D sound fields that vary as a function of distance to source, depth, and azimuth. Sound sources are modelled at representative sites and the resulting sound fields are assigned to source locations using the minimum Euclidean distance. The sound received by an animal at any given time depends on its location relative to the source. Because the true locations of the animals within the sound fields are unknown, realistic animal movements are simulated using repeated random sampling of various behavioural parameters. The Monte Carlo method of simulating many animals within the operations area is used to estimate the sound exposure history of the population of simulated animals (animats).

Monte Carlo methods provide a heuristic approach for determining the probability distribution function (PDF) of complex situations, such as animals moving in a sound field. The probability of an event's occurrence is determined by the frequency with which it occurs in the simulation. The greater the number of random samples, in this case the more simulated animats, the better the approximation of the PDF. Animats are randomly placed, or seeded, within the simulation boundary at a specified density (animats/km^2). Higher densities provide a finer PDF estimate resolution but require more computational resources. To ensure good representation of the PDF, the animat density is set as high as practical allowing for computation time. The animat density is much higher than the real-world density to ensure good representation of the PDF. The resulting PDF is scaled using the real-world density.

Several models for marine mammal movement have been developed (Ellison et al. 1987, Frankel et al. 2002, Houser 2006). These models use an underlying Markov chain to transition from one state to another based on probabilities determined from measured swimming behaviour. The parameters may represent simple states, such as the speed or heading of the animal, or complex states, such as likelihood of participating in foraging, play, rest, or travel. Attractions and aversions to variables like anthropogenic sounds and different depth ranges can be included in the models.

The JASCO Animal Simulation Model Including Noise Exposure (JASMINE) was based on the open-source marine mammal movement and behaviour model (3MB, Houser 2006) and used to predict the exposure of animats to sound arising from the anthropogenic activities. Animats are programmed to behave like the species likely to be present in the survey area. The parameters used for forecasting realistic behaviours (e.g., diving, foraging, aversion, surface times, etc.) are determined and interpreted from marine species studies (e.g., tagging studies) where available, or reasonably extrapolated from related species. An individual animat's modelled sound exposure levels are summed over the total simulation duration to determine its total received energy, and then compared to the assumed threshold criteria.

JASMINE uses the same animal movement algorithms as 3MB (Houser, 2006), but has been extended to be directly compatible with JASCO's Marine Operations Noise Model (MONM) and Full Waveform Range-dependent Acoustic Model acoustic field predictions, for inclusion of source tracks, and importantly for animats to change behavioural states based on time and space dependent modelled variables such as received levels for aversion behaviour, although aversion was not considered in this study.

D.4.1. Animal Movement Parameters

JASMINE uses previously measured behaviour to forecast behaviour in new situations and locations. The parameters used for forecasting realistic behaviour are determined (and interpreted) from marine species studies (e.g., tagging studies). Each parameter in the model is described as a probability distribution. When limited or no information is available for a species parameter, a Gaussian or uniform distribution may be chosen for that parameter. For the Gaussian distribution, the user determines the mean and standard deviation of the distribution from which parameter values are drawn. For the uniform distribution, the user determines the maximum and minimum distribution from which parameter values are drawn. When detailed information about the movement and behaviour of a species are available, a user-created distribution vector, including cumulative transition probabilities, may be used (referred to here as a vector model; Houser 2006). Different sets of parameters can be defined for different behaviour states. The probability of an animat starting out in or transitioning into a given behaviour state can in turn be defined in terms of the animat's current behavioural state, depth, and the time of day. In addition, each travel parameter and behavioural state has a termination function that governs how long the parameter value or overall behavioural state persists in simulation.

The parameters used in JASMINE describe animal movement in both the vertical and horizontal planes. The parameters relating to travel in these two planes are briefly described below.

Travel sub-models

- **Direction**– determines an animat's choice of direction in the horizontal plane. Sub-models are available for determining the heading of animats, allowing for movement to range from strongly biased to undirected. A random walk model can be used for behaviours with no directional preference, such as feeding and playing. In a random walk, all bearings are equally likely at each parameter transition time step. A correlated random walk can be used to smooth the changes in bearing by using the current heading as the mean of the distribution from which to draw the next heading. An additional variant of the correlated random walk is available that includes a directional bias for use in situations where animals have a preferred absolute direction, such as migration. A user-defined vector of directional probabilities can also be input to control animat heading. For more detailed discussion of these parameters, see Houser (2006) and Houser and Cross (1999).

- **Travel rate**–defines an animat's rate of travel in the horizontal plane. When combined with vertical speed and dive depth, the dive profile of the animat is produced.

Dive sub-models

- **Ascent rate**–defines an animat's rate of travel in the vertical plane during the ascent portion of a dive.
- **Descent rate**–defines an animat's rate of travel in the vertical plane during the descent portion of a dive.
- **Depth**–defines an animat's maximum dive depth.
- **Reversals**–determines whether multiple vertical excursions occur once an animat reaches the maximum dive depth. This behaviour is used to emulate the foraging behaviour of some marine mammal species at depth. Reversal-specific ascent and descent rates may be specified.
- **Surface interval**–determines the duration an animat spends at, or near, the surface before diving again.

D.4.2. Exposure Integration Time

The interval over which acoustic exposure (L_E) should be integrated and maximal exposure (L_p) determined is not well defined. Both Southall et al. (2007) and the NMFS (2018) recommend a 24 h baseline accumulation period, but state that there may be situations where this is not appropriate (e.g., a high-level source and confined population). Resetting the integration after 24 h can lead to overestimating the number of individual animals exposed because individuals can be counted multiple times during an operation. The type of animal movement engine used in this study simulates realistic movement using swimming behaviour collected over relatively short periods (hours to days) and does not include large-scale movement such as migratory circulation patterns. For this study, a representative 24-hour period was simulated.

Ideally, a simulation area is large enough to encompass the entire range of a population so that any animal that could approach the source during an operation is included. However, there are limits to the simulation area, and computational overhead increases with area. For practical reasons, the simulation area is limited. In the simulation, every animat that reaches a border is replaced by another animat entering at the opposing border—e.g., an animat crossing the northern border of the simulation is replaced by one entering the southern border at the same longitude. When this action places the animat in an inappropriate water depth, the animat is randomly placed on the map at a depth suited to its species definition. The exposures of all animats (including those leaving the simulation and those entering) are kept for analysis. This approach maintains a consistent animat density and allows for longer integration periods with finite simulation areas.

D.4.3. Seeding Density and Scaling

Seeding density refers to the spatial sample rate, in units of animats/km^2, used in the simulation. It is not related to the real-world animal density, but rather is a model parameter that controls the how samples are drawn from the model space. The minimum required seeding density for any given project depends on several factors such as bathymetry, source characteristics, and the behavioural profile of the animats, with the main constraint being computation time and resources. Seeding density is adjusted as needed based on model conditions specific to a project or project area.

In the present study, the exposure criteria for continuous sounds were used to determine the number of animats exceeding exposure thresholds. To generate statistically reliable probability density functions, all simulations were seeded with an animat density of 4 animat/km^2 over the entire simulation area. The modelling results are not related to real-world animal densities and the number of real-world animals potentially exposed was not calculated.

Appendix E. Model Validation Information

Predictions from JASCO's Airgun Array Source Model (AASM) and propagation models (MONM, FWRAM and VSTACK) have been validated against experimental data from a number of underwater acoustic measurement programs conducted by JASCO globally, including the United States and Canadian Artic, Canadian and southern United States waters, Greenland, Russia and Australia (Hannay and Racca 2005, Aerts et al. 2008, Funk et al. 2008, Ireland et al. 2009, O'Neill et al. 2010, Warner et al. 2010, Racca et al. 2012a, Racca et al. 2012b, Matthews and MacGillivray 2013, Martin et al. 2015, Racca et al. 2015, Martin et al. 2017a, Martin et al. 2017b, Warner et al. 2017, MacGillivray 2018, McPherson et al. 2018, McPherson and Martin 2018).

In addition, JASCO has conducted measurement programs associated with a significant number of anthropogenic activities which have included internal validation of the modelling (including McCrodan et al. 2011, Austin and Warner 2012, McPherson and Warner 2012, Austin and Bailey 2013, Austin et al. 2013, Zykov and MacDonnell 2013, Austin 2014, Austin et al. 2015, Austin and Li 2016, Martin and Popper 2016).

Appendix F. Additional Sound Field Maps

F.1. Area 1

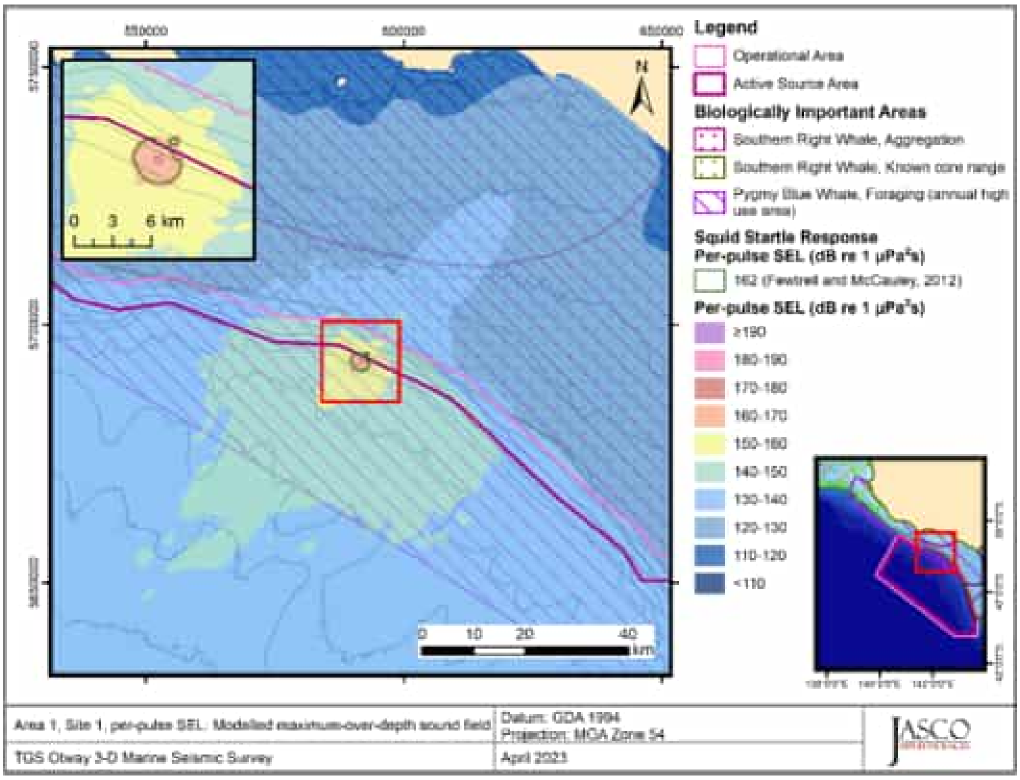


Figure F-1. *Area 1, Site 1, tow azimuth 312º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

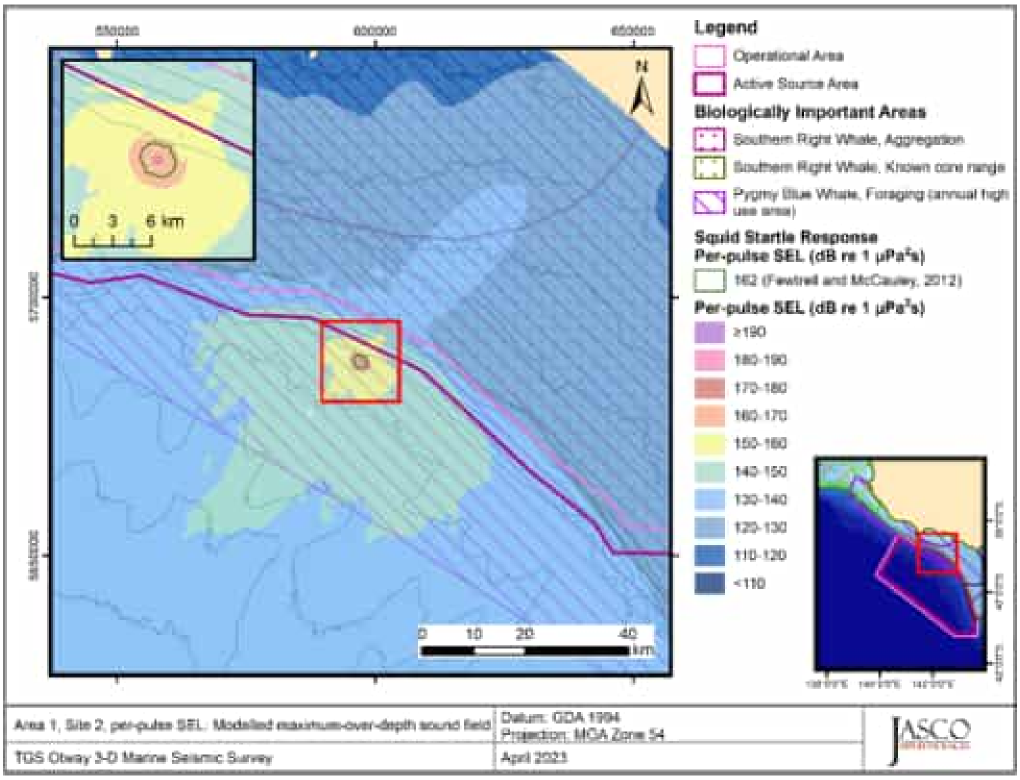


Figure F-2. *Area 1*, *Site 2, tow azimuth 312º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

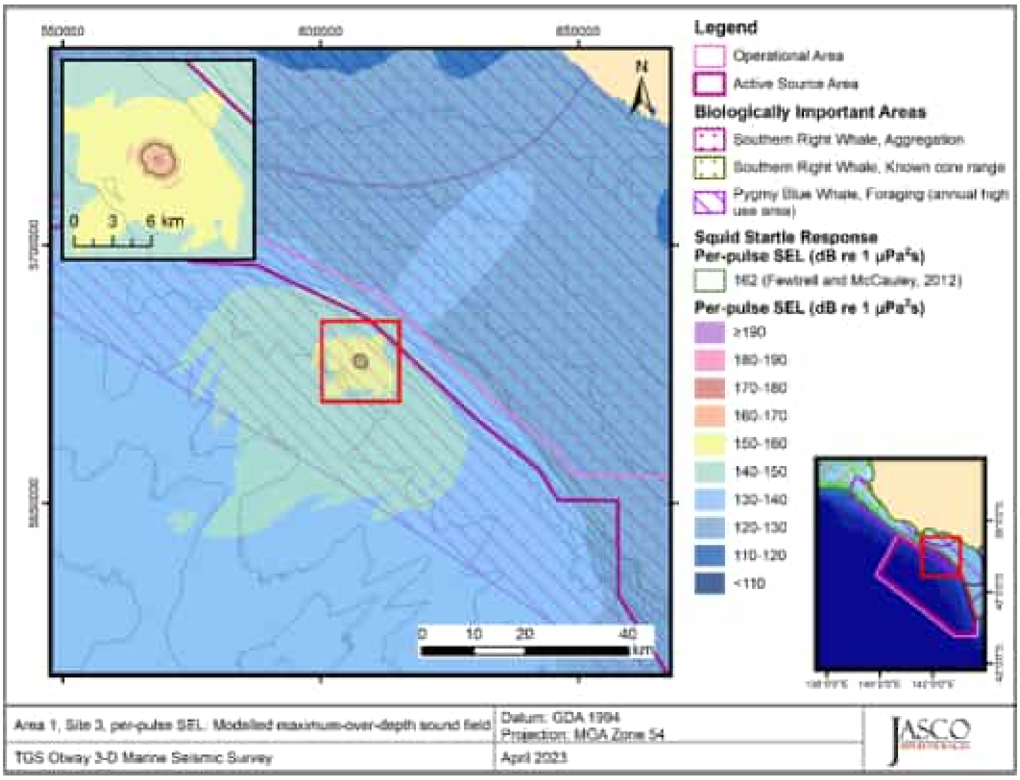


Figure F-3. *Area 1*, *Site 3, tow azimuth 312º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

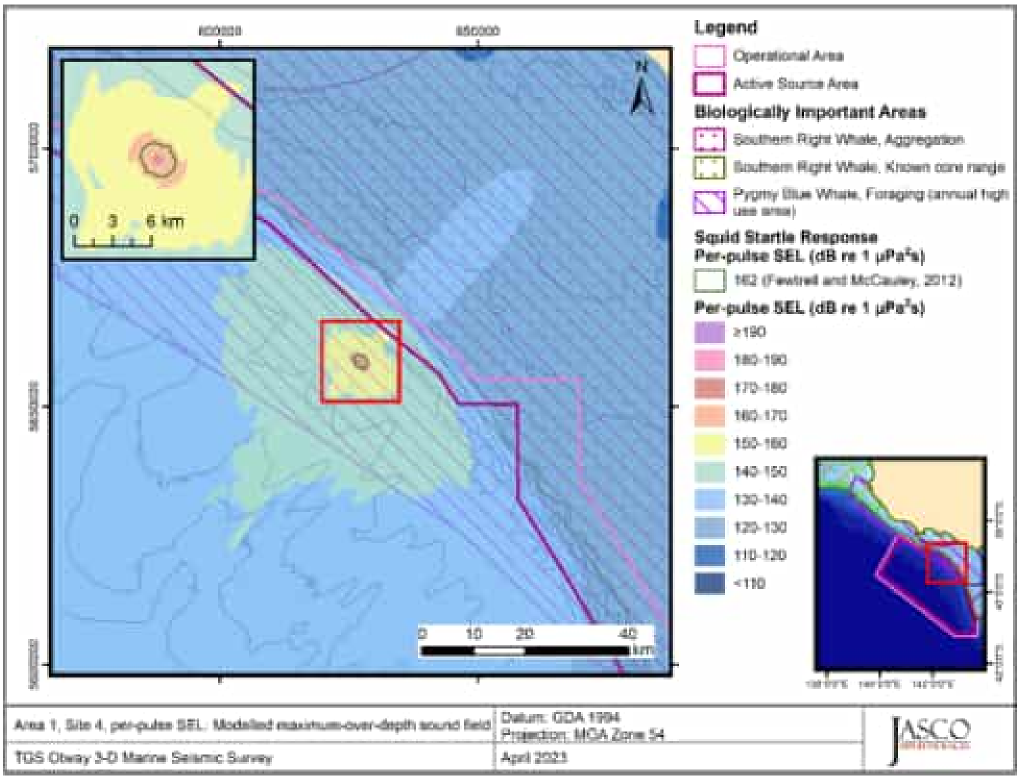


Figure F-4. *Area 1*, *Site 4, tow azimuth 312º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

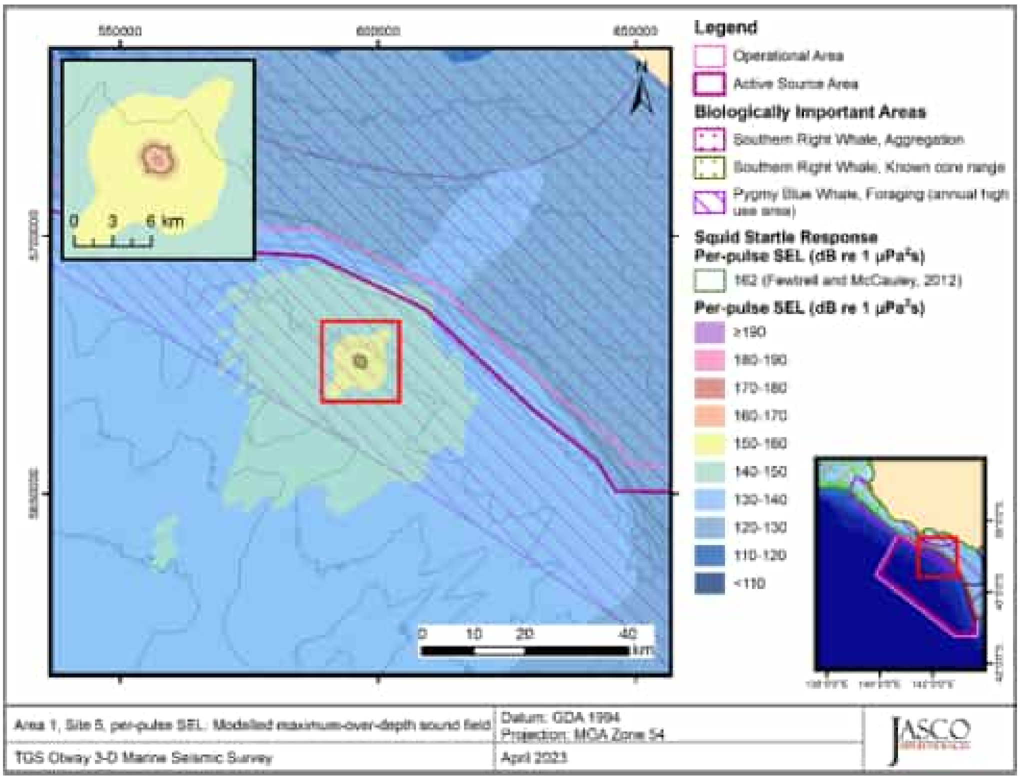


Figure F-5. *Area 1*, *Site 5, tow azimuth 132º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

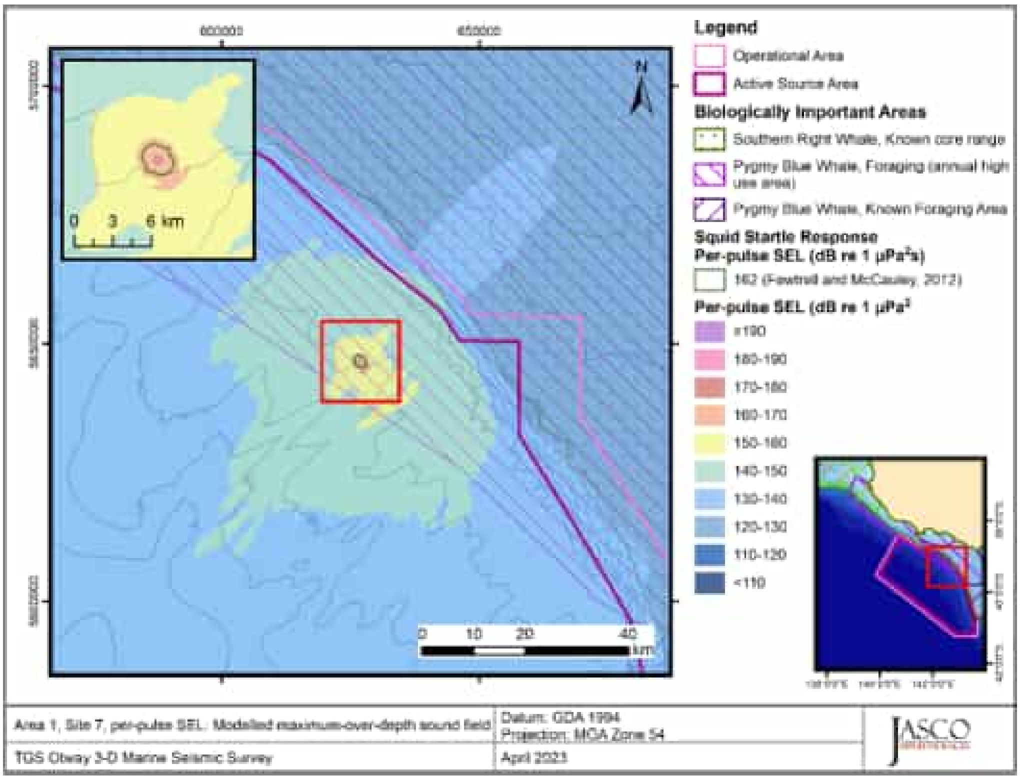


Figure F-6. *Area 1, Site 6, tow azimuth 132º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

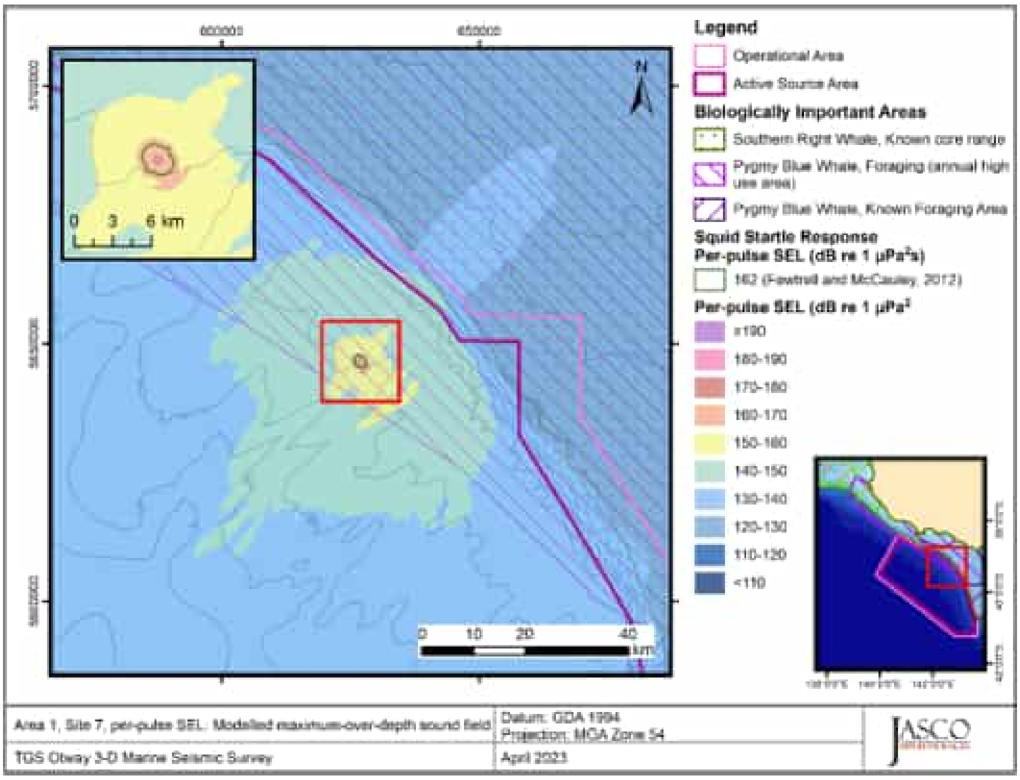


Figure F-7. *Area 1, Site 7, tow azimuth 132º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

F.2. Area 2

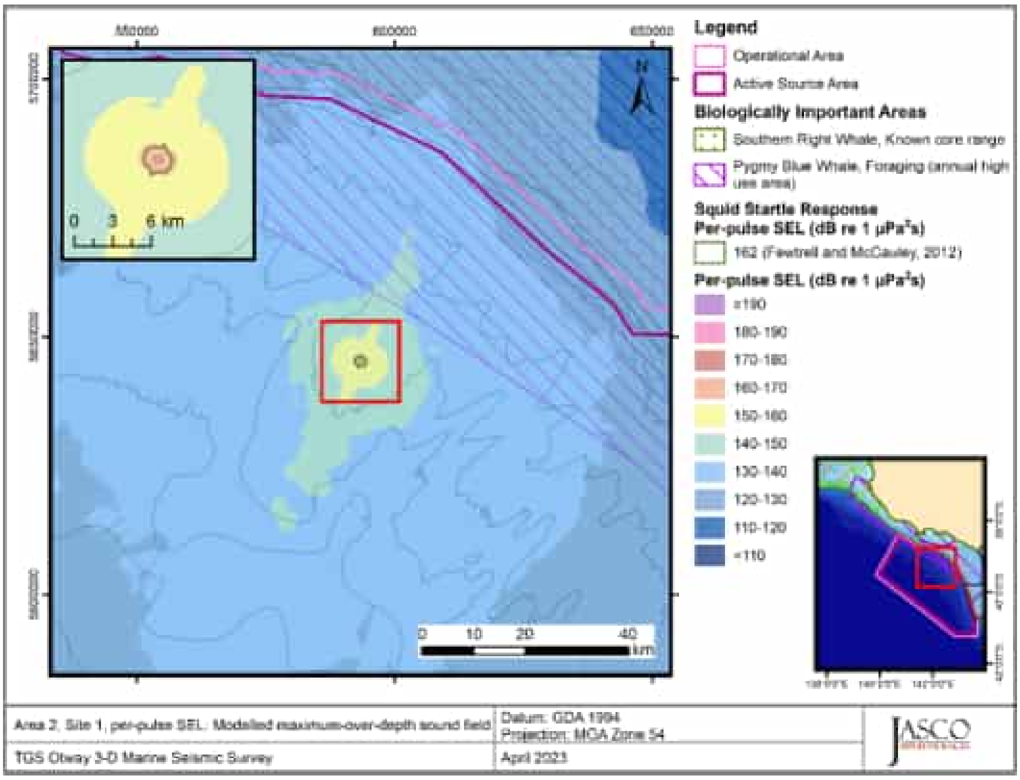


Figure F-8. *Area 2*, *Site 1, tow azimuth 294°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

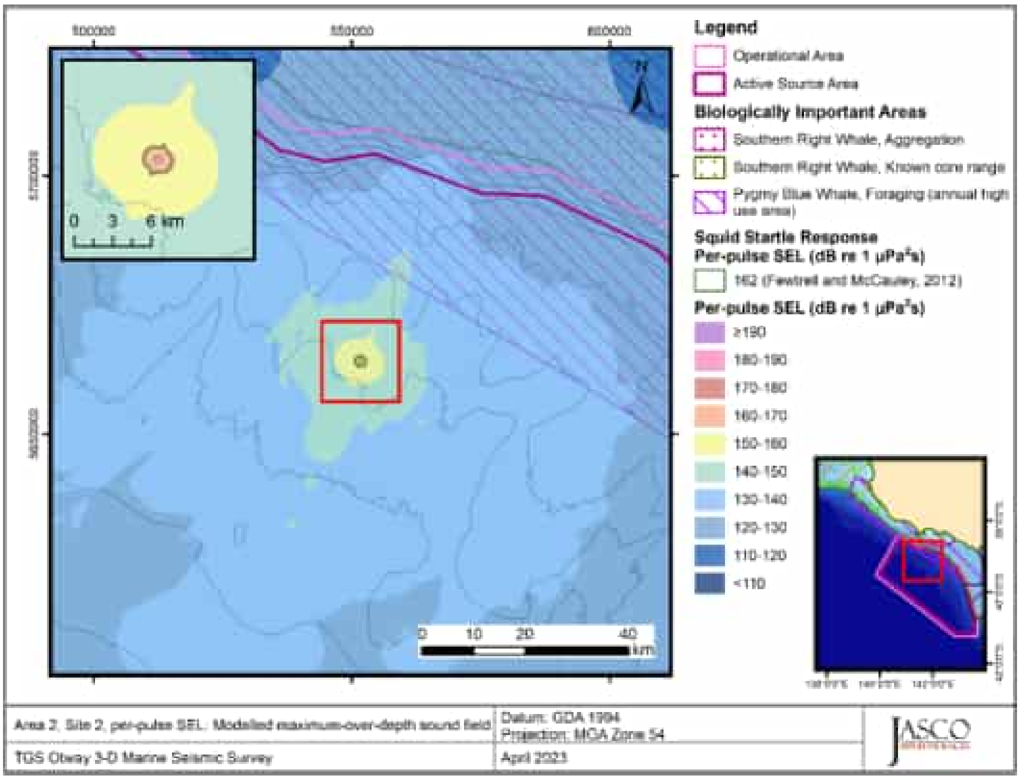


Figure F-9. *Area 2*, *Site 2, tow azimuth 294°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

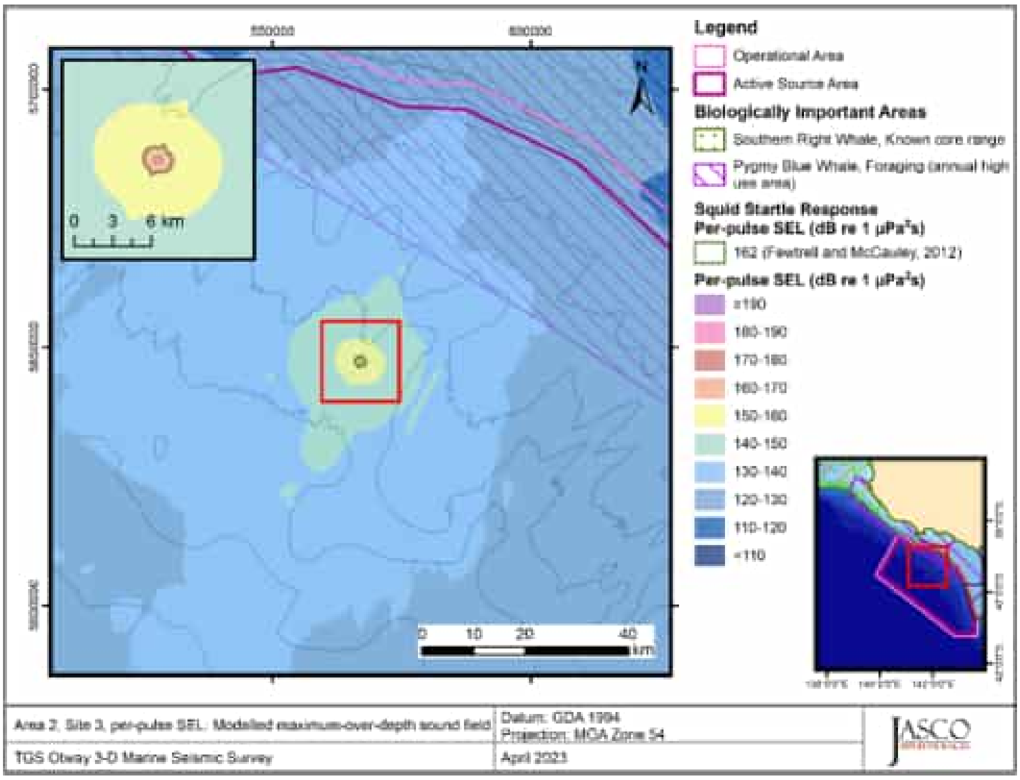


Figure F-10. *Area 2, Site 3, tow azimuth 114º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

F.3. Area 3

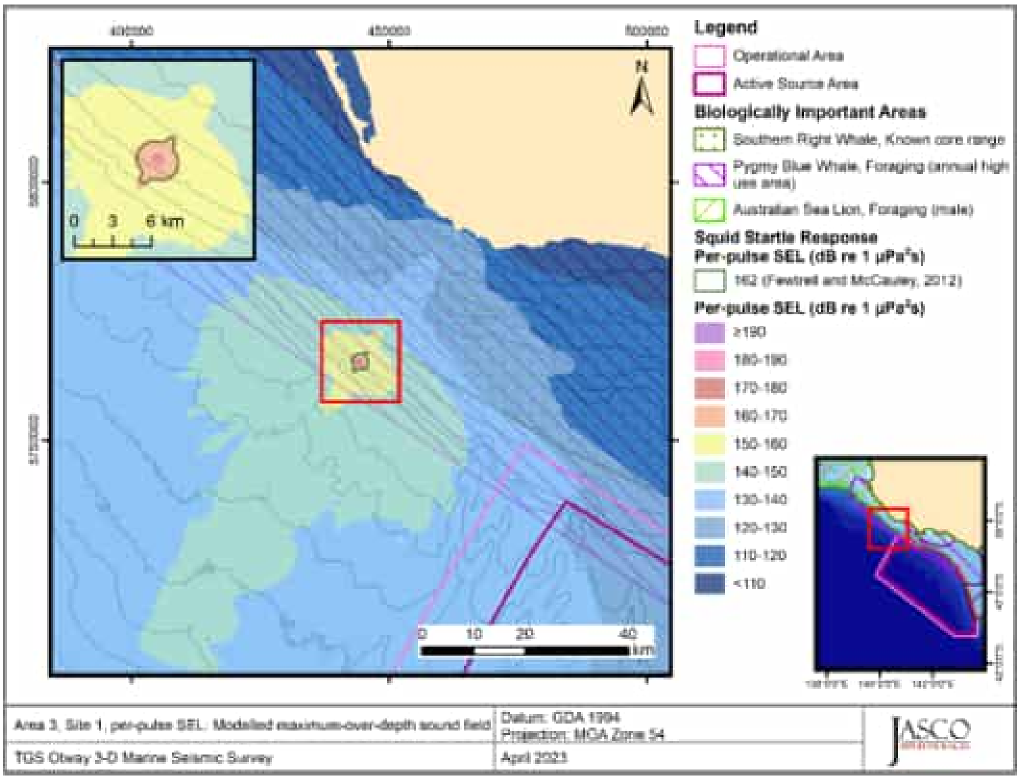


Figure F-11. *Area 3, Site 1, tow azimuth 305º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

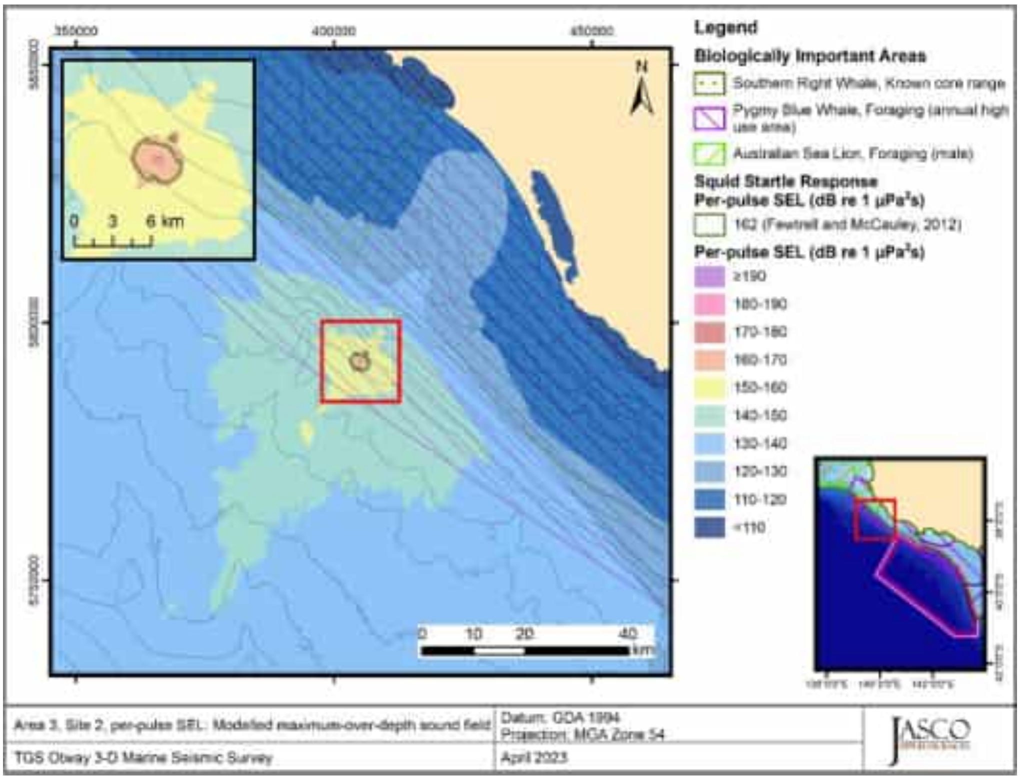


Figure F-12. *Area 3, Site 2, tow azimuth 305º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

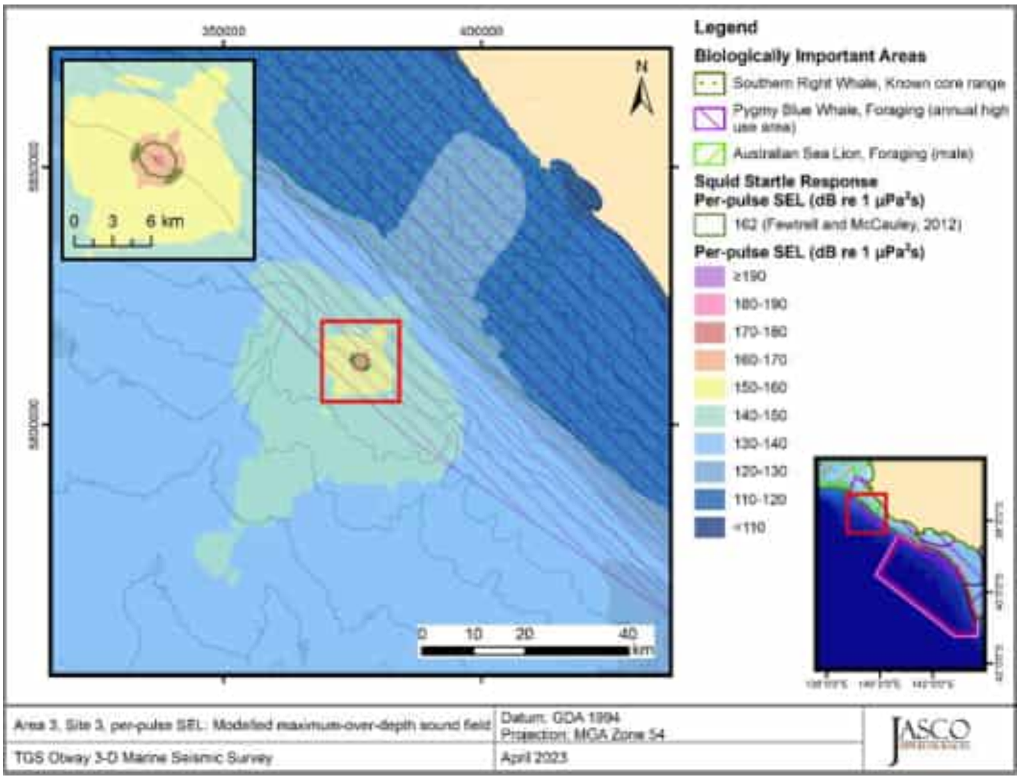


Figure F-13. *Area 3, Site 3, tow azimuth 305º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

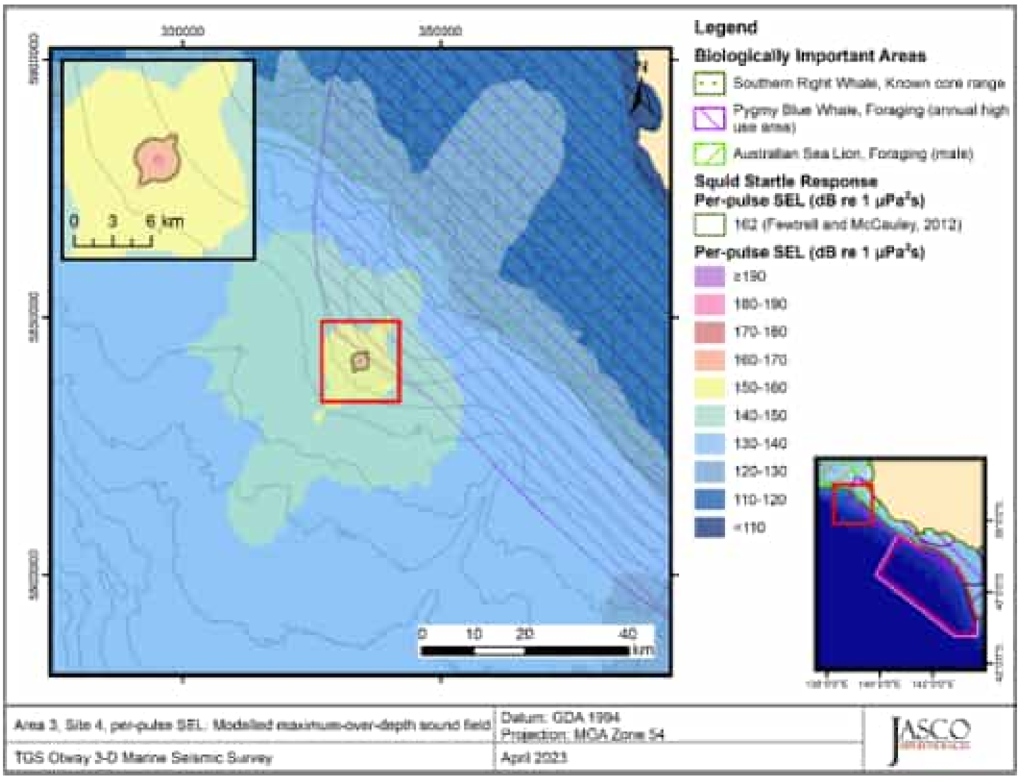


Figure F-14. *Area 3, Site 4, tow azimuth 305º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

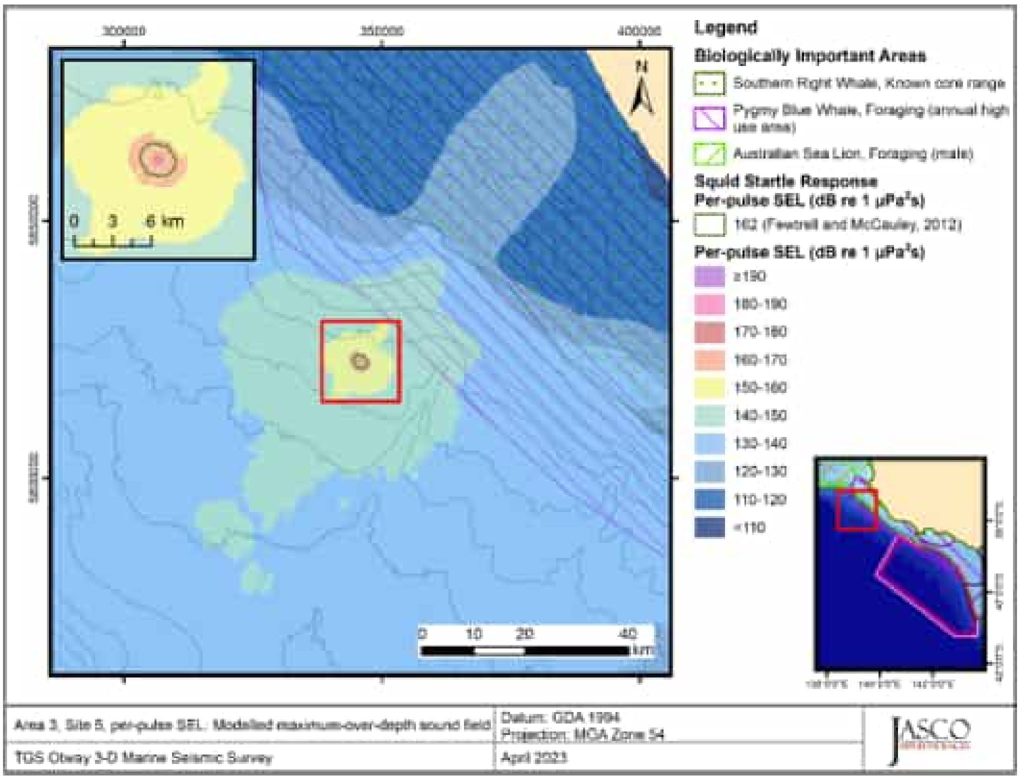


Figure F-15. *Area 3, Site 5, tow azimuth 125º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

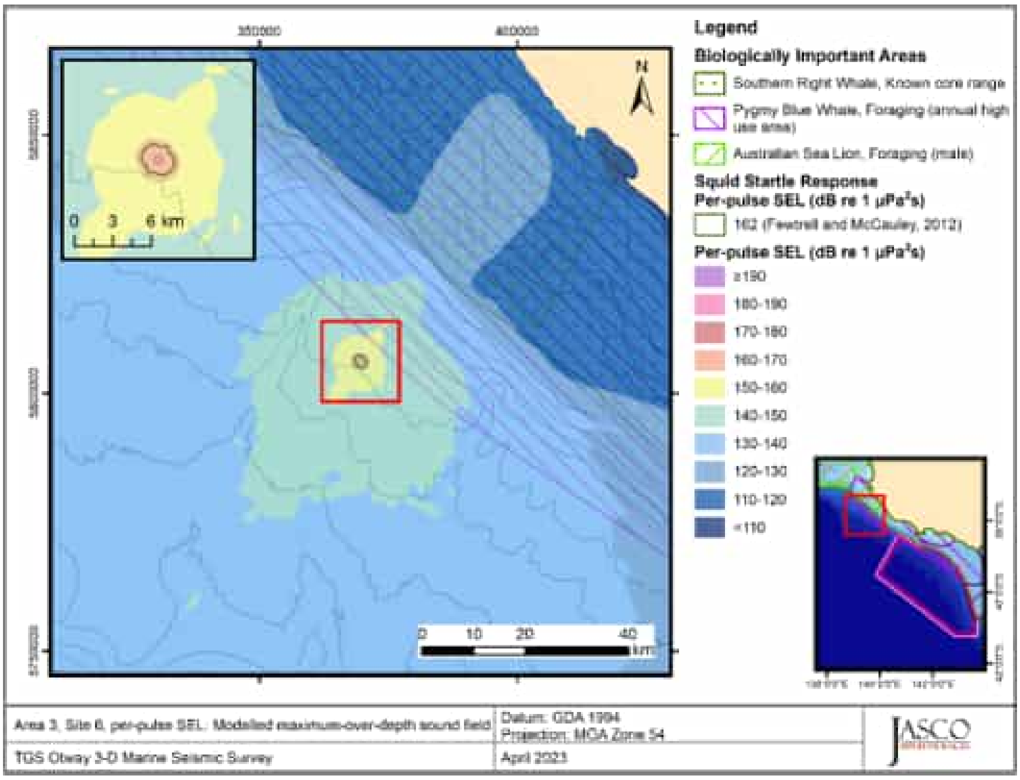


Figure F-16. *Area 3, Site 6, tow azimuth 125º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

F.4. Standalone Sites

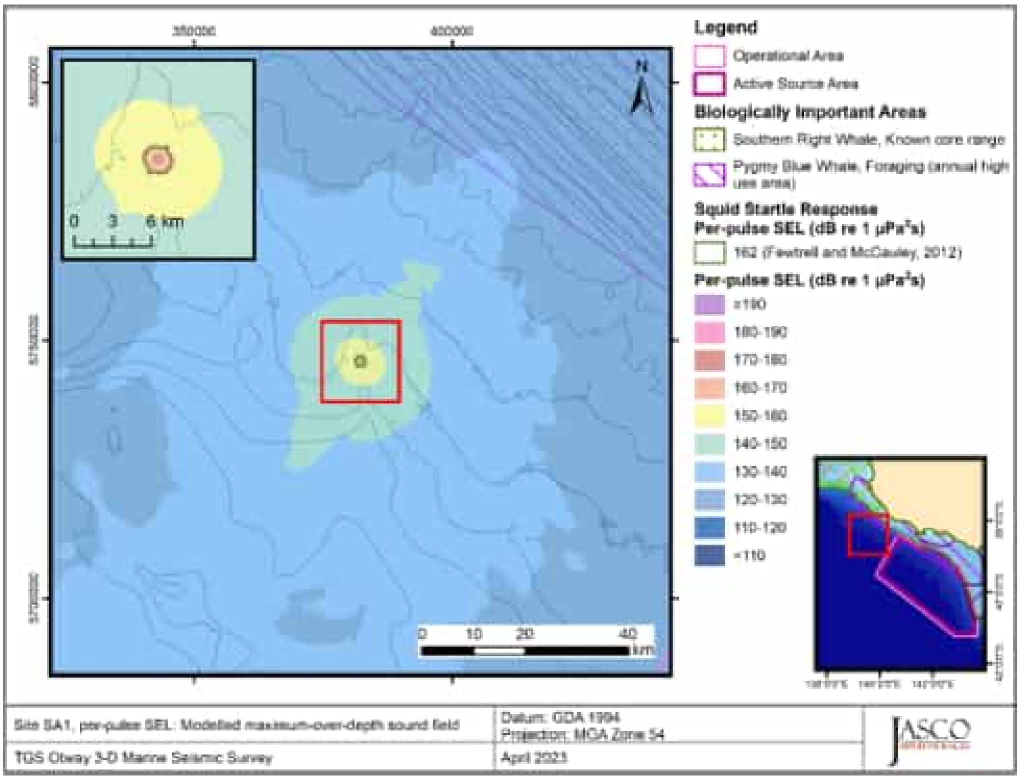


Figure F-17. Standalone Site 1*, tow azimuth 305º, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

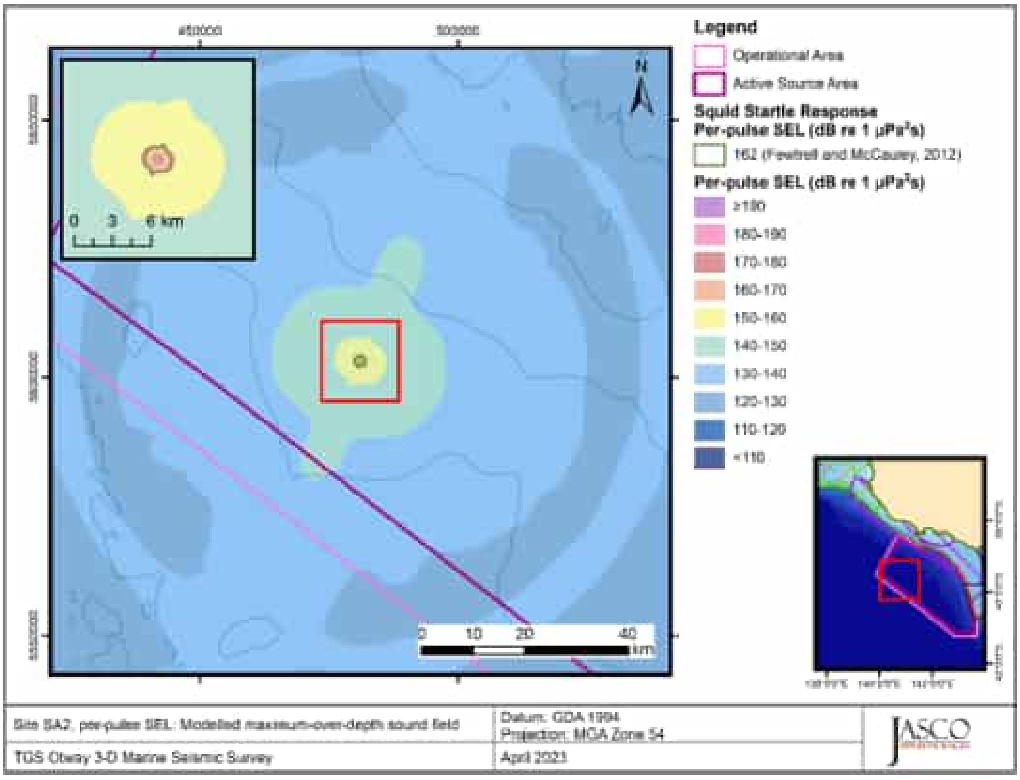


Figure F-18. Standalone Site 2*, tow azimuth 292°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

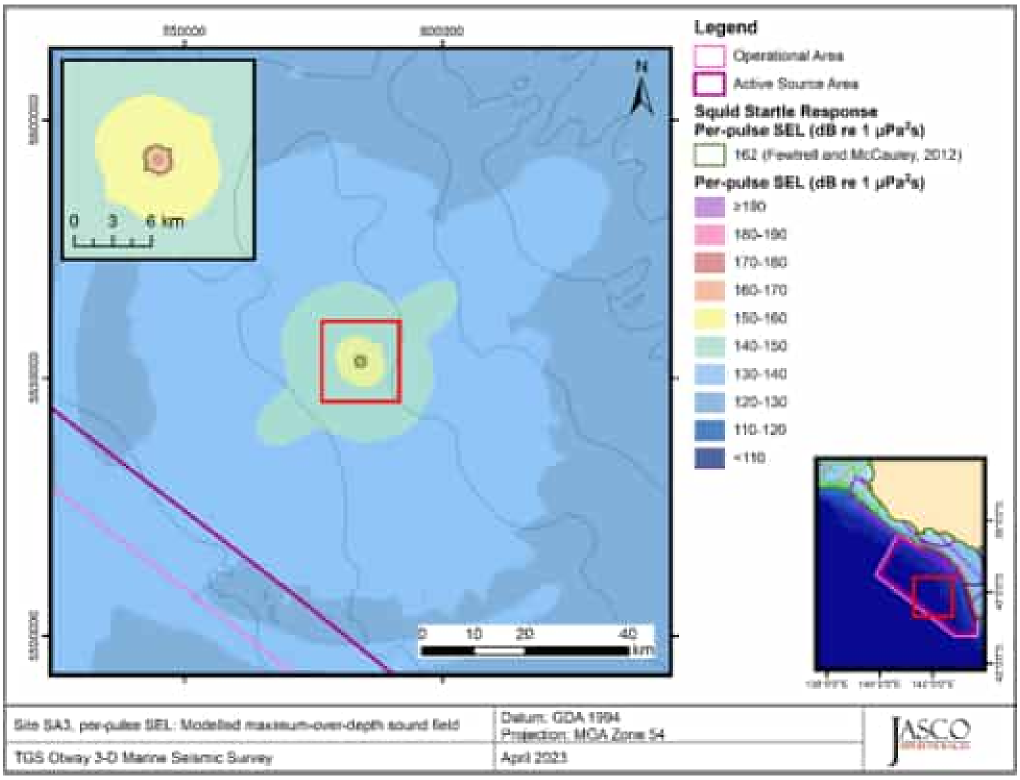


Figure F-19. Standalone Site 3*, tow azimuth 322°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

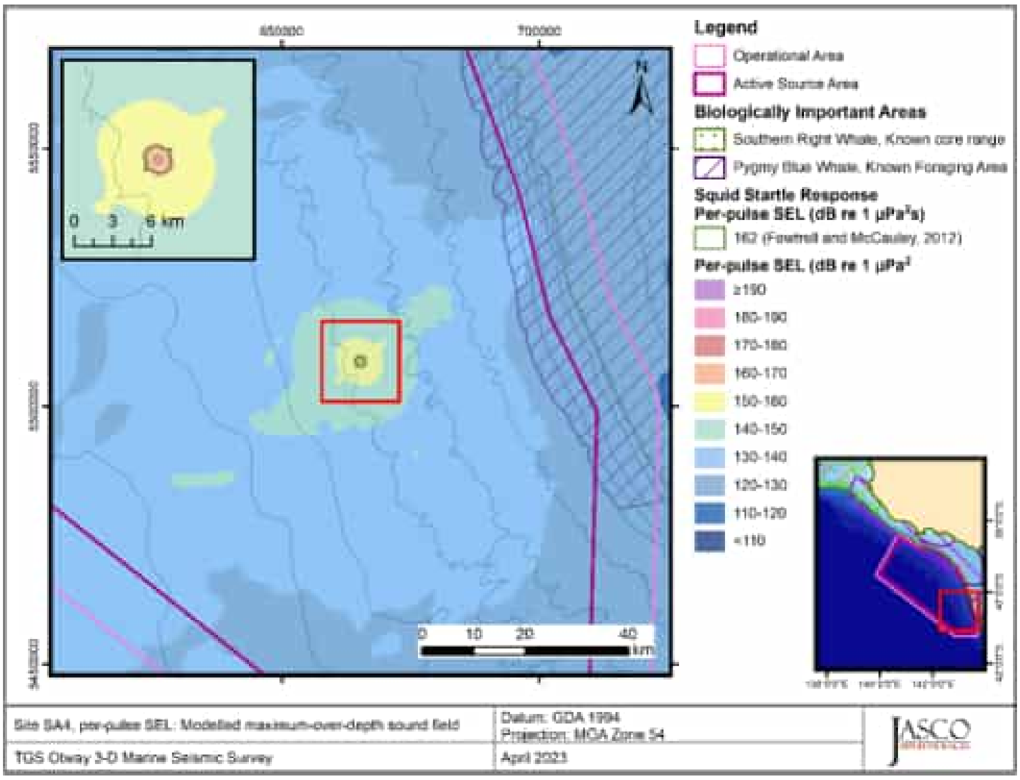


Figure F-20. Standalone Site 4*, tow azimuth 322°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

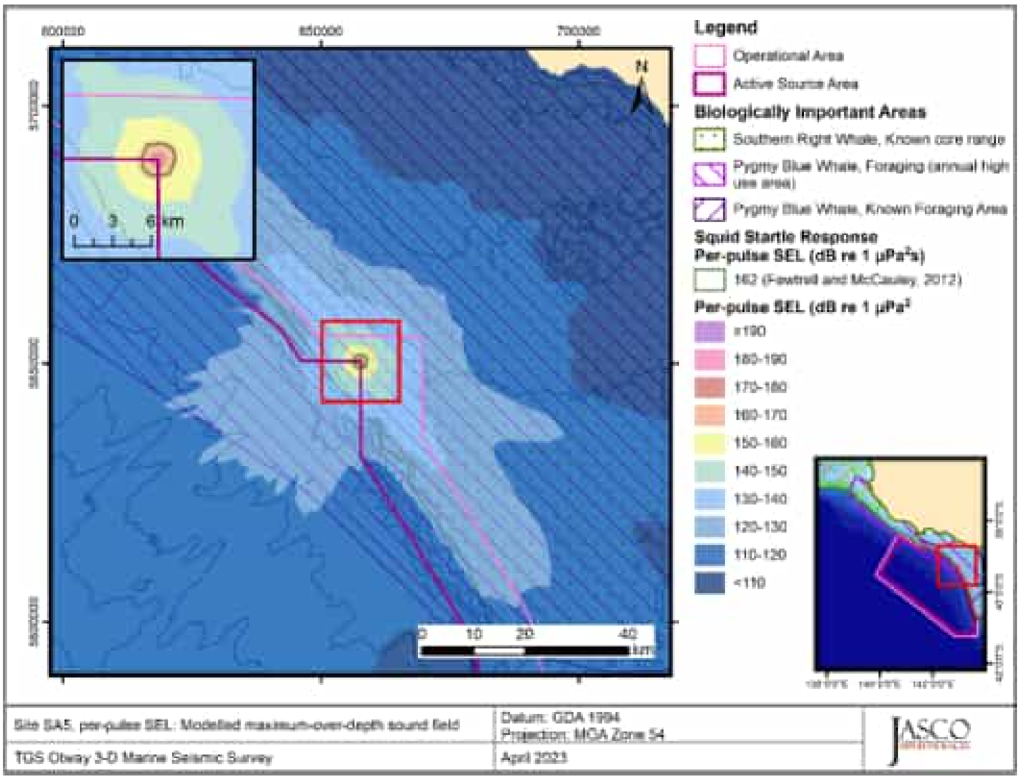


Figure F-21. Standalone Site 5*, tow azimuth 232°, SEL:* Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the squid startle response and low-power zone.

APPENDIX C

Oil Spill Trajectory Modelling Report

TGS SLB OTWAY BASIN 3D MULTI-CLIENT MMS

Oil Spill Modelling

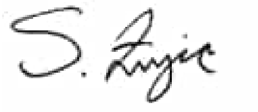
MAQ1271J
TGS SLB Otway Basin 3D
Multi-Client MMS
Rev1
2 June 2023

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Rev A	Draft issued for internal review	Dr Sasha Zigic	Dr Ryan Dunn		20 March 2023
Rev 0	Draft issued for client review			Dr Sasha Zigic	30 March 2023
Rev 1	Issued to client		Dr Sasha Zigic	Dr Sasha Zigic	2 June 2023

Approval for issue

Dr Sasha Zigic		2 June 2023

Prepared by:

RPS

Dr Sasha Zigic
General Manager

PO Box 1048,
Robina, QLD, 4230
Lakehouse Corporate Space, Suite 425
Level 2, 34-38 Glenferrie Drive
Robina, QLD, 4226
T +61 7 5553 6900
E sasha.zigic@rpsgroup.com

Prepared for:

SLR

Dan Govier
Technical Director

6/A Cambridge Street,
Nelson, New Zealand, 7020

T +64 274 898 628
E dgovier@slrconsulting.com

TERMS AND ABBREVIATIONS

Terms	Meaning
°	Degrees
‘	Minutes
“	Seconds
µm	Micrometre (unit of length; 1 µm = 0.001 mm)
Actionable oil	Oil which is thick enough for the effective use of mitigation strategies
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute gravity. A measure of how heavy or light a petroleum liquid is compared to water.
ASTM	American Society for Testing and Materials
Bonn Agreement	An agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances, 1983, includes: Governments of the Kingdom of Belgium, the Kingdom of Denmark, the French Republic, the Federal Republic of Germany, the Republic of Ireland, the Kingdom of the Netherlands, the Kingdom of Norway, the Kingdom of Sweden, the United Kingdom of Great Britain and Northern Ireland and the European Union.
BP	Boiling point. The temperature at which the vapor pressure of the liquid is equal to the pressure exerted on it by the surrounding atmosphere
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
˚C	degree Celsius (unit of temperature)
CFSR	Climate Forecast System Reanalysis
cm	Centimetre (unit of length)
cP	Centipoise (unit of dynamic viscosity)
Decay	The process where oil components are changed either chemically or biologically (biodegradation) to another compound. It includes breakdown to simpler organic carbon compounds by bacteria and other organisms, photo-oxidation by solar energy, and other chemical reactions.
Dynamic viscosity	The dynamic viscosity of a fluid expresses its resistance to shearing flows, where adjacent layers move parallel to each other with different speeds.
EP	Environmental Plan
Floating oil exposure	Contact by floating oil on the sea surface at concentrations equal to or exceeding defined threshold concentrations. The consequence will vary depending on the threshold and the receptors
g/m^2	Grams per square meter (unit of surface area density)
GODAE	Global Ocean Data Assimilation Experiment
HYCOM	Hybrid Coordinate Ocean Model. A data-assimilative, three-dimensional ocean model
HYDROMAP	Advanced ocean/coastal tidal model used to predict tidal water levels, current speed and current direction.
IBRA	Interim Biogeographic Regionalisation for Australia
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
ITOPF	International Tanker Owners Pollution Federation Limited
KEF	Key Ecological Feature
km	Kilometre (unit of length)
km^2	Square Kilometres (unit of area)

Knots	unit of speed (1 knot = 0.514 m/s)
m	Meter (unit of length)
m^3	Cubic meter (unit of volume)
m/s	Meter per Second (unit of speed)
MAHs	Monoaromatic Hydrocarbons
MMA	Marine Management Area
MP	Marine Park
NASA	National Aeronautics and Space Administration (USA)
NCEP	National Centres for Environmental Prediction (USA)
nm	Nautical mile
NOAA	National Oceanic and Atmospheric Administration (USA)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NP	National Park
NR	Nature Reserve
NRC	National Research Council
OPEP	Oil Pollution Emergency Plan
PAH	Polynuclear Aromatic Hydrocarbons
Pour Point	The pour point of a liquid is the temperature below which the liquid loses its flow characteristics
ppb	Parts per billion (concentration)
psu	Practical salinity units
Ramsar site	A site listed under the Ramsar Convention on wetlands which is an international intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
RSB	Reefs, Shoals and Banks
Shoreline contact	Arrival of oil at or near shorelines at on-water concentrations equal to or exceeding defined threshold concentrations. Shoreline contact is judged for floating oil arriving within a 2 km buffer zone from any shoreline as a conservative measure
SIMAP	Spill Impact Model Application Package. SIMAP is designed to simulate the fate and effects of spilled hydrocarbons for surface or subsea releases
Single Oil spill modelling	Oil spill modelling involving a computer simulation of a single hypothetical oil spill event subject to a single sequence of wind, current and other sea conditions over time. Single oil spill modelling, also referred to as “deterministic modelling” provides a simulation of one possible outcome of a given spill scenario, subject to the metocean conditions that are imposed. Single oil spill modelling is commonly used to consider the fate and effects of ‘worst-case’ oil spill scenarios that are carefully selected in consideration of the nature and scale of the offshore petroleum activity and the local environment (NOPSEMA, 2017). Because the outcomes of a single oil spill simulation can only represent the outcome of that scenario under one sequence of metocean conditions, worst-case conditions are often identified from stochastic modelling. It is impossible to calculate the likelihood of any outcome from a single oil spill simulation. Single oil spill modelling is generally used for response planning, preparedness planning and for supporting oil spill response operations in the event of an actual spill
SRTM	Shuttle Radar Topography Mission
Stochastic oil spill modelling	Stochastic oil spill modelling is created by overlaying and statistically analysing the outcomes of many single oil-spill simulations of a defined spill scenario, where each simulation was subject to a different sequence of metocean conditions, selected objectively (typically by random selection) from a long sequence of historic conditions for the study area. Analysis of this larger set of simulations provides a more accurate indication of the environment that maybe affected (EMBA) and indicates which locations are more likely to be affected (as well as other statistics). Stochastic oil spill modelling avoids biases that affect single oil spill modelling (due to the reliance on only one possible sequence of conditions). However, when interpreting stochastic modelling, which is based

	on a wide range of potential conditions that might happen to occur, it is essential to understand that calculations will encompass a much larger area than could be affected in any single spill event, where a more limited set of conditions will occur. Consequently, it is misleading to imply that the region derived from stochastic modelling indicate the outcomes expected from a single spill event (NOPSEMA, 2017) Stochastic modelling is generally used for risk assessment and preparedness planning by indicating locations that could be exposed and may require response or subsequent impact assessment
TOPEX/Poseidon	A joint satellite mission between NASA and CNES to map ocean surface topography using an array of satellites equipped with detailed altimeters
USA	United States of America
World Ocean Atlas	A collection of objectively analysed quality controlled physicochemical parameters (e.g. temperature, salinity, oxygen, phosphate, silicate, and nitrate) based on profile data from the World Ocean Database established by NOAA's National Centers for Environmental Information (NCEI)
WGS 1984	World Geodetic System 1984 (WGS84); reference coordinate system

Contents

Tables

Figures

EXECUTIVE SUMMARY

Background

TGS-NOPEC Geophysical Company Pty Ltd (TGS) and Schlumberger (SLB) propose to undertake a marine seismic survey (MSS) in the proposed Environment Plan (EP) area in the Otway Basin.

To support the development of EP and oil pollution emergency plan (OPEP), a modelling study was undertaken that considered a hypothetical spill originating from a survey vessel tank rupture, releasing 1,066 m^3 of marine diesel oil (MDO) over 6 hours on the sea surface. The modelling results are presented as an annual assessment (combined seasons).

The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill.

Methodology

The modelling study was carried out in stages. Firstly, a 10 year wind and current dataset (2010 – 2019) with the three-dimensional current data including the influence of ocean and tidal currents. Secondly, the currents, winds and detailed MDO properties were used as inputs in the three-dimensional oil spill model (SIMAP) to simulate the drift, spread, weathering and fate of the spilled hydrocarbons.

Due to the size of the EP Area, spill modelling was conducted from five release locations, which were carefully selected based on their proximity to shorelines and sensitive receptors. As spills can occur during any set of wind and current conditions, 100 spill simulations were modelled at each location (i.e. 500 simulations total), with the same spill information (volume, duration and composition of hydrocarbons) but different start times. This ensured that each simulation was exposed to a unique set of wind and current conditions.

Once all 100 simulations were run per location, the results were combined to determine the potential exposure to the surrounding waters, shorelines and sensitive receptors based on the thresholds outlined in the NOPSEMA Oil Spill Modelling Bulletin (NOPSEMA 2019).

Oil Properties

The MDO used in this study has a density of 829.1 kg/m^3 (API gravity of 37.6) and a dynamic viscosity of 4.0 cP at 25ºC, classifying it as a Group II light persistent oil according to the International Tankers Owners Pollution Federation (ITOPF, 2014) and USEPA/USCG classifications. MDO is characterised by a high percentage of volatile components (95%), which will evaporate when on the sea surface. It also contains 5% persistent hydrocarbons, which will not evaporate, though will decay over time. It is important to note that some heavy components contained in MDO have a strong tendency to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but can re-float to the surface when the winds ease.

Results

- The maximum distance from a release site to low (1-10 g/m^2), moderate (10-50 g/m^2) and high (≥50 g/m^2) exposure levels were 243.2 km east (Release Location 1), 52.5 km east-southeast (Release Location 1) and 22.9 km south-southeast (Release Location 4), respectively.

- Floating oil exposure to Australian Marine Parks (AMPs) at the low threshold was predicted for Location 3 (Apollo 11%) and Location 4 (Zeehan 65%). Twelve spill simulations (12% probability) at the low threshold crossed into the Victorian state waters from Location 1. From Location 4, the probability of the spill simulations crossing the Tasmanian and Victorian state waters at the low threshold was 10% and 1%, respectively. The Discovery Bay and Twelve Apostles Marine Parks (MPs) were exposed by 2 and 1 simulations (2% and 1% probability), respectively from Location 1.

- The probability of accumulation on any shoreline at, or above, the low threshold (≥ 10 g/m^2) was greatest at Location 5 (65%), while the minimum time before shoreline accumulation was 1.7 days at Location 1. The maximum volume of oil ashore for a single spill above the low threshold was greatest at Location 1 (126.5 m^3) and lowest at Location 2 (28.7 m^3). The maximum lengths of shoreline contacted at the low and moderate thresholds were 65.0 km (Location 5) and 15.0 km (Locations 1 and 4), respectively. Additionally, the maximum lengths of oil accumulation on shorelines at the high threshold (≥1,000 g/m^2) was 2 km recorded at Location 1 and 4.

- Greatest probabilities of oil accumulation to shoreline sectors at the low threshold for a spill occurring from Locations 1, 2, 3, 4 and 5, was recorded at Corangamite (22%), Colac Otway (10%), King Island (9%), King Island (37%) and West Coast (42%) shorelines, respectively. The King Island shoreline also recorded the greatest probabilities of oil accumulation for the moderate and high thresholds from spills occurring at Location 4 (20% and 3%, respectively). Glenelg recorded the quickest time before oil accumulation at the low threshold at 1.67 days from a spill at Location 1. The Glenelg shoreline was also predicted to experience the greatest peak volume ashore of 123.6 m^3 from a spill occurring at Location 1.

- Dissolved hydrocarbon exposure to AMPs at the low threshold (≥10 ppb) in the 0-10 m depth layer was recorded at Apollo (4% Location 2, 9% Location 3 and 2% Location 4%), Boags (1% Location 5), Franklin (5% Location 5) and Zeehan (1% Location 3 and 29% Location 4).

- By incorporating the results from all five selected locations, a total of nine AMPs were predicted to be exposed by entrained hydrocarbons at the low threshold (≥ 10 ppb), with probabilities up to 40%. Apollo AMP was predicted to record the highest probabilities of exposure at 40% and 39% from spills originating from Location 3 and Location 1, respectively. Additionally, the Apollo AMP recorded the greatest probability of exposure at the high threshold (≥ 100 ppb) at 25% from spills originating from Location 3.

1 INTRODUCTION

1.1 Background

TGS-NOPEC Geophysical Company Pty Ltd (TGS) and Schlumberger proposes to undertake marine seismic survey (MSS) in the proposed Environment Plan (EP) area as shown in Figure 1.1.

In order to support the preparation of the EP and Oil pollution Emergency Plan (OPEP), SLR on behalf of TGS, commissioned RPS to undertake a comprehensive oil spill modelling study for the proposed MSS. The study assessed the risk and potential exposure to the surrounding waters and shoreline accumulation from a hypothetical spill originating from a survey vessel tank rupture, releasing 1,066 m^3 of marine diesel oil (MDO) over 6 hours on the sea surface.

Due to the size of the EP Area, spill modelling was conducted at five release locations, which were carefully selected based on their proximity to shorelines and sensitive receptors (shown in Table 1.1 and Figure 1.1).

The modelling results are presented as an annual assessment (i.e. any time of year).

The spill modelling was performed using an advanced three-dimensional trajectory and fates model; Spill Impact Model Application Package (SIMAP). The SIMAP model calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the physical and chemical properties. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill.

The hydrocarbon spill model, the method and analysis applied herein uses modelling algorithms which have been peer reviewed and published in international journals. Further, RPS warrants that this work meets and exceeds the American Society for Testing and Materials (ASTM) Standard F2067-13 "*Standard Practice for Development and Use of Oil Spill Models*".

Table 1.1 Coordinates for the five selected oil spill release locations.

Release Locations	Latitude*	Longitude*
1	38° 24' 23.8" S	140° 43' 31.5" E
2	38° 45' 46.2" S	141° 38' 8.1" E
3	39° 14' 11.7" S	142° 57' 56.7" E
4	39° 43' 20.0" S	143° 13' 20.2" E
5	40° 57' 6.4" S	143° 38' 23.4" E

*Datum: WGS 1984

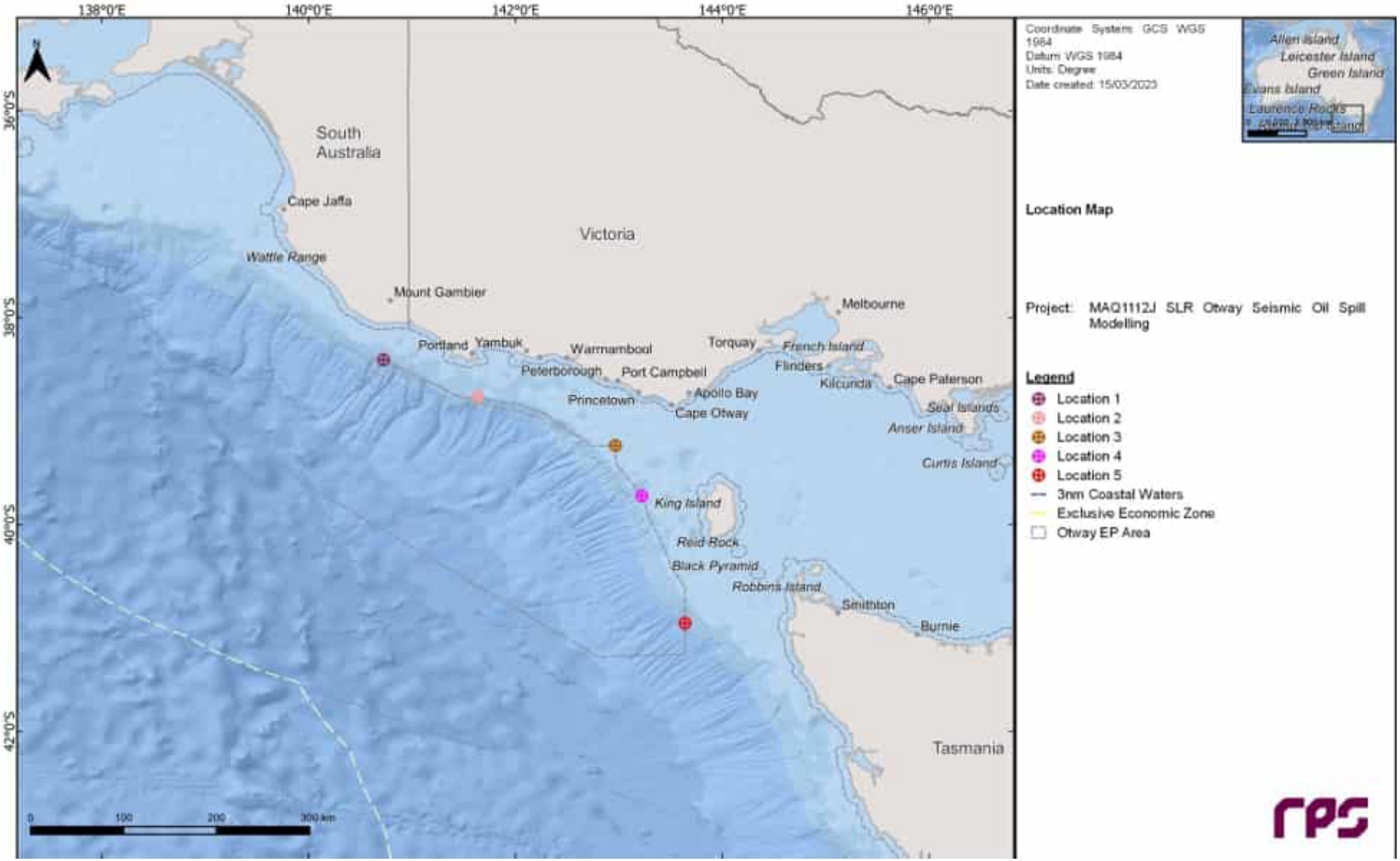


Figure 1.1 Locations of the five oil spill modelling release locations.

1.1 What is Oil Spill Modelling?

Oil spill modelling is a valuable tool widely used for risk assessment, emergency response and contingency planning where it can be particularly helpful to proponents and decision makers. By modelling a series of the most likely oil spill scenarios, decisions concerning suitable response measures and strategic locations for deploying equipment and materials can be made, and the locations at most risk can be identified. The two types of oil spill modelling often used are stochastic (Section 1.1.1) and deterministic (Section 1.1.2) modelling.

1.1.1 Stochastic Modelling (Multiple Spill Simulations)

Stochastic oil spill modelling is created by overlaying a great number (often hundreds) of individual, computer-simulated hypothetical spills (NOPSEMA, 2018; Figure 1.2).

Stochastic modelling is a common means of assessing the potential risks from oil spills related to new projects and facilities. Stochastic modelling typically utilises hydrodynamic data for the location in combination with historic wind data. Typically, 100 iterations of the model will be run utilising the data that is most relevant to the season or timing of the project.

The outcomes are often presented as a probability of exposure and is primarily used for risk assessment purposes in view to understand the range of environments that may be affected or impacted by a spill. Elements of the stochastic modelling can also be used in oil spill preparedness and planning.

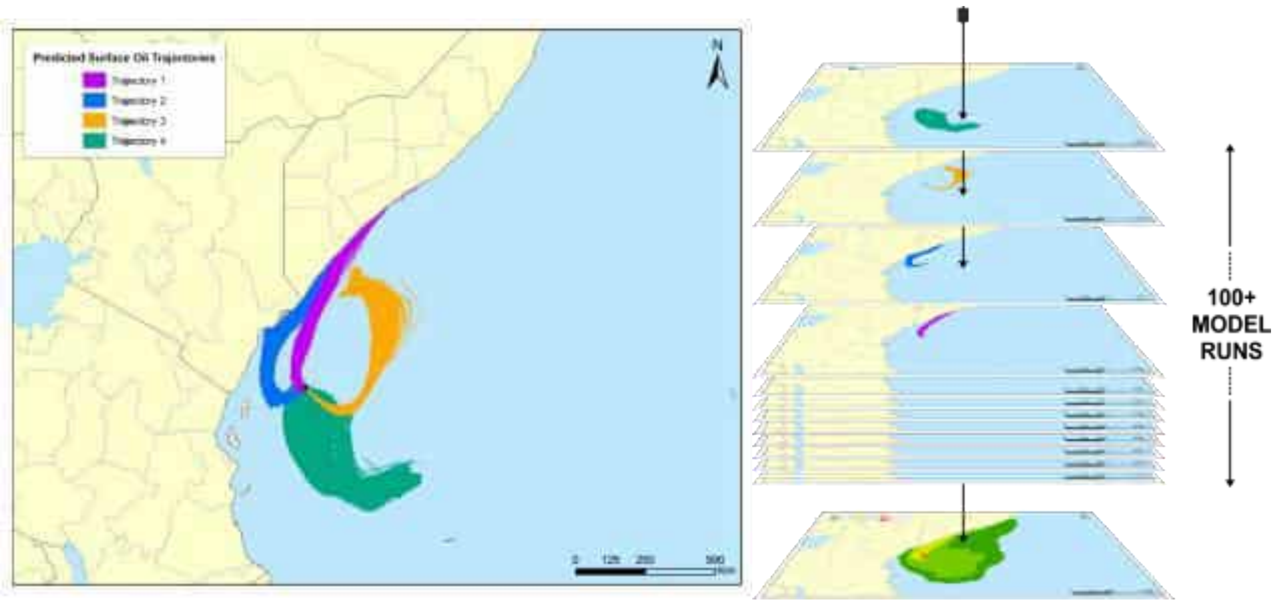


Figure 1.2 Examples of four individual spill trajectories (four replicate simulations) predicted by SIMAP for a spill scenario. The frequency of contact with given locations is used to calculate the probability of impacts during a spill. Essentially, all model runs are overlain (shown as the stacked runs on the right) and the number of times that trajectories contact a given location at a concentration is used to calculate the probability.

1.1.2 Deterministic Modelling (Single Spill Simulation)

Deterministic modelling is the predictive modelling of a single incident subject to a single sample of wind and weather conditions over time (NOPSEMA, 2018; Figure 1.3).

Deterministic modelling is often paired with stochastic modelling to place the large stochastic footprint into perspective. This deterministic analysis is generally a single run selected from the stochastic analysis and serves as the basis for developing the plans and equipment needs for a realistic spill response. Deterministic spills can be selected on based on parameters such as minimum time to shoreline, largest swept area, maximum volume ashore and longest length of shoreline contacted by hydrocarbons.

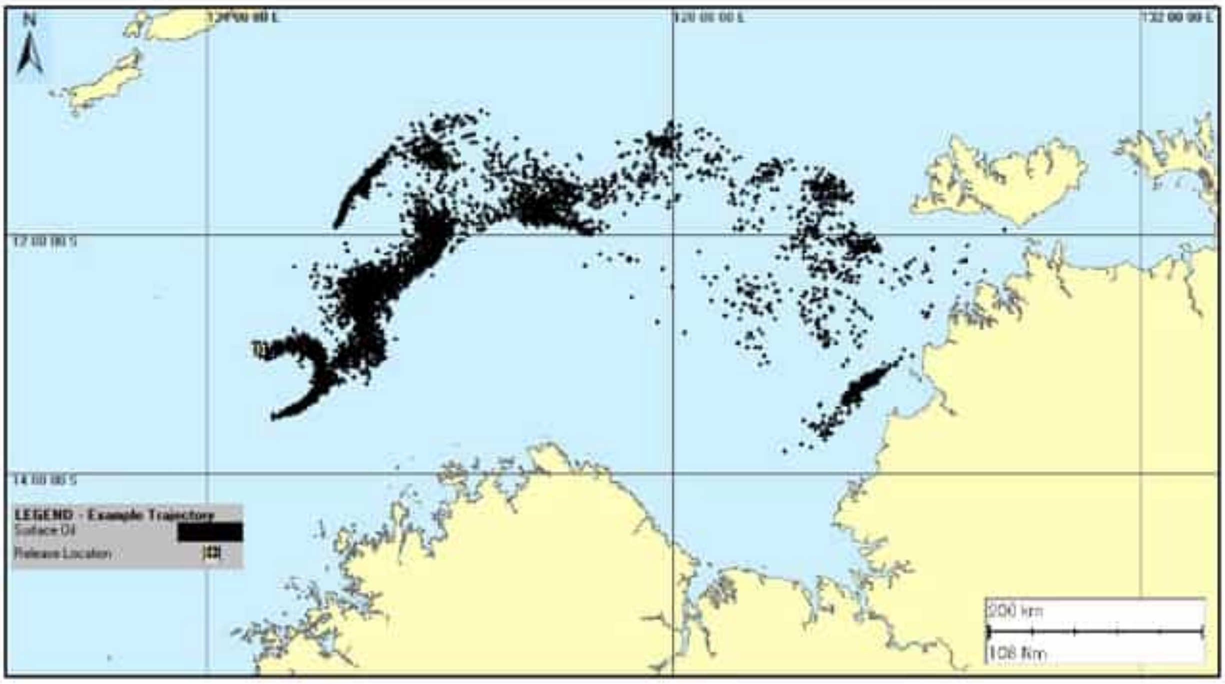


Figure 1.3 Example of an individual spill trajectory predicted by SIMAP for a spill scenario. Note, this image represents surface oil as spill and does not take any thresholds into consideration.

2 SCOPE OF WORK

The scope of work included the following components:

1. Generate ten years (2010 to 2019 (inclusive)) of wind and current data. The three-dimensional current data includes the combined influence of ocean and tidal currents;
2. Input the wind data, current data and MDO characteristics into the three-dimensional oil spill model SIMAP, to model the movement, spreading, weathering and shoreline accumulation by hydrocarbons over time;
3. One hundred simulations were run at each of the 5 selected locations (i.e. 500 simulations total), with each simulation having the same spill information (volume, duration and composition of hydrocarbons) but different start times to ensure unique set of wind and current conditions were sampled.
4. Combine the results and present the summaries including probabilities of exposure for each of the five selected locations and present the exposure from floating oil, shoreline accumulation and in-water exposure (dissolved and entrained hydrocarbons) based upon the NOPSEMA thresholds.
5. Present images illustrating the extent of the floating oil exposure, shoreline accumulation and in-water exposure (dissolved and entrained hydrocarbons) based on all 500 simulations.
6. Combine the results from the 500 spill simulations to assess the low threshold environment that maybe affected (EMBA); and
7. At each of the five selected locations identify and present the deterministic simulations resulting in the maximum volume of oil ashore. As well as the simulation resulting in the largest swept area above the low threshold of 1 g/m^2 from all 500 simulations was identified and presented. The results can be used to inform response planning.

3 REGIONAL CURRENTS

Bass Strait is a body of water separating Tasmania from the southern Australian mainland, specifically the state of Victoria. The strait is a relatively shallow area off the continental shelf, connecting the southeast Indian Ocean with the Tasman Sea. Currents within the straight are primarily driven by tides, winds, incident continental shelf waves and density driven flows; high winds and strong tidal currents are frequent within the area (Jones, 1980).

The varied geography and bathymetry of the region, in addition to the forcing of the south-eastern Indian Ocean and local meteorology lead to complex shelf and slope circulation patterns (Middleton & Bye, 2007). Figure 3.1 displays seasonal current trends within the Bass Strait. During winter there is a strong eastward water flow due to the strengthening of the South Australian Current (fed by the Leeuwin Current in the Northwest Shelf), which bifurcates with one extension moving though the Bass Strait, and another forming the Zeehan Current off western Tasmania (Sandery & Kampf, 2007). During summer, water flow reverses off Tasmania, King Island and the Otway Basin travelling eastward, as the coastal current develops due to south-easterly winds.

Therefore, to accurately account for the movement of an oil spill, which can move between the offshore and near shore region, ocean and tidal currents were combined as part of the study. The following sections provide a summary of the regional current data set.

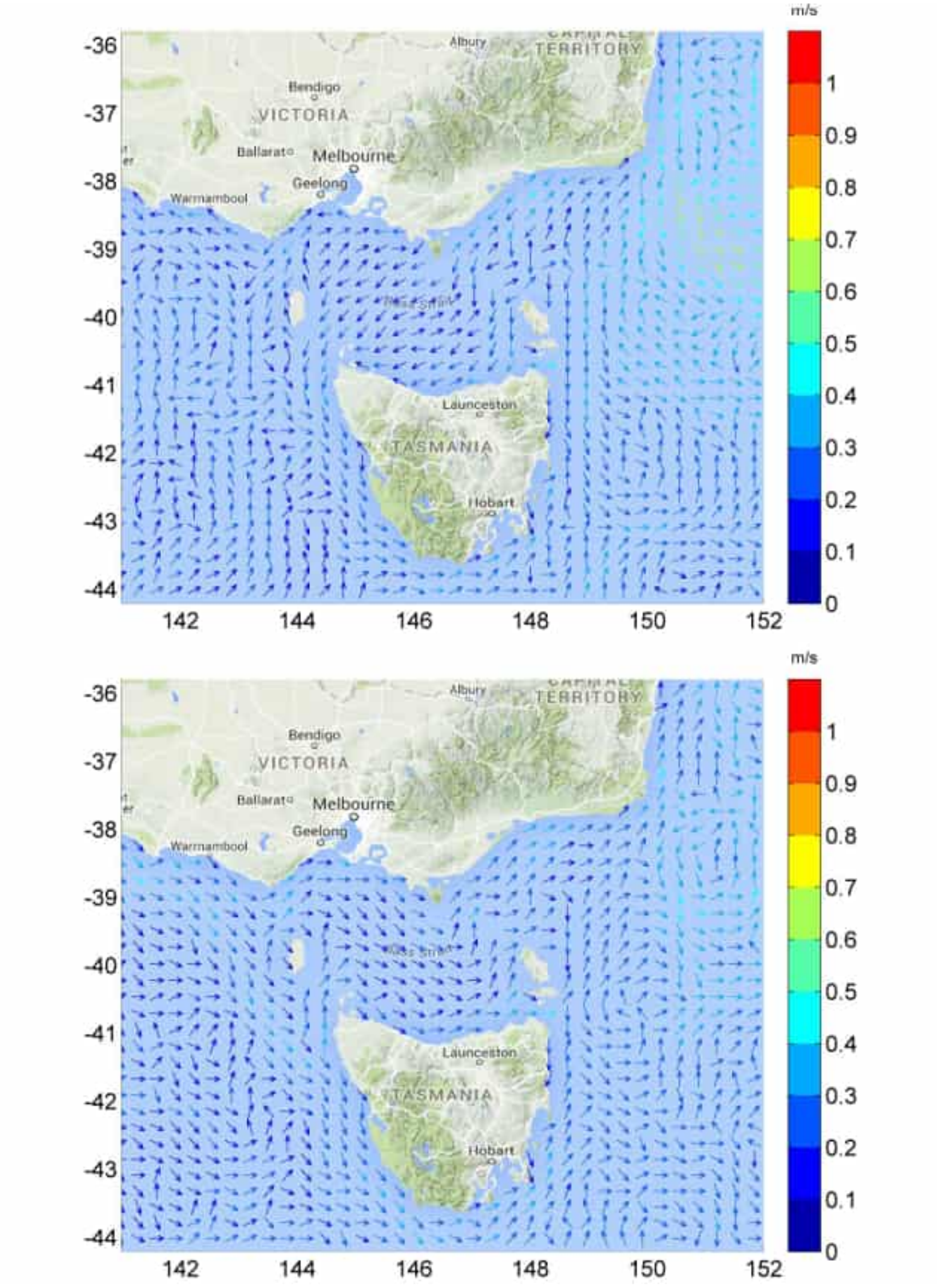


Figure 3.1 HYCOM averaged seasonal surface drift currents during summer (upper image) and winter (lower image).

3.1 Tidal Currents

Tidal current data was generated using RPS's advanced ocean/coastal model, HYDROMAP. The HYDROMAP model has been thoroughly tested and verified through field measurements throughout the world for more than 30 years (Isaji & Spaulding, 1984; Isaji, et al., 2001; Zigic, et al., 2003). HYDROMAP tidal current data has been used as input to forecast (in the future) and hindcast (in the past) pollutant spills in Australian waters and forms part of the Australian National Oil Spill Emergency Response System operated by Australian Maritime Safety Authority (AMSA).

HYDROMAP employs a sophisticated sub-gridding strategy, which supports up to six levels of spatial resolution, halving the grid cell size as each level of resolution is employed. The sub-gridding allows for higher resolution of currents within areas of greater bathymetric and coastline complexity, and/or of interest to a study.

The numerical solution methodology follows that of Davies (1977a and 1977b) with further developments for model efficiency by Owen (1980) and Gordon (1982). A more detailed presentation of the model can be found in Isaji and Spaulding (1984) and Isaji et al. (2001).

3.1.1 Grid Setup

The tidal model domain has been sub-gridded down to a resolution of 500 m for shallow and coastal regions, starting from an offshore (or deep water) resolution of 8 km. The finer grids were allocated in a step-wise fashion to resolve flows more accurately along the coastline, around islands and over regions with more complex bathymetry. Figure 3.2 shows the tidal model grid covering the study domain.

A combination of datasets was used and merged to describe the shape of the seabed within the grid domain (Figure 3.3). These included spot depths and contours which were digitised from nautical charts released by the hydrographic offices as well as Geoscience Australia database and depths extracted from the Shuttle Radar Topography Mission (SRTM30_PLUS) Plus dataset (see Becker et al., 2009).

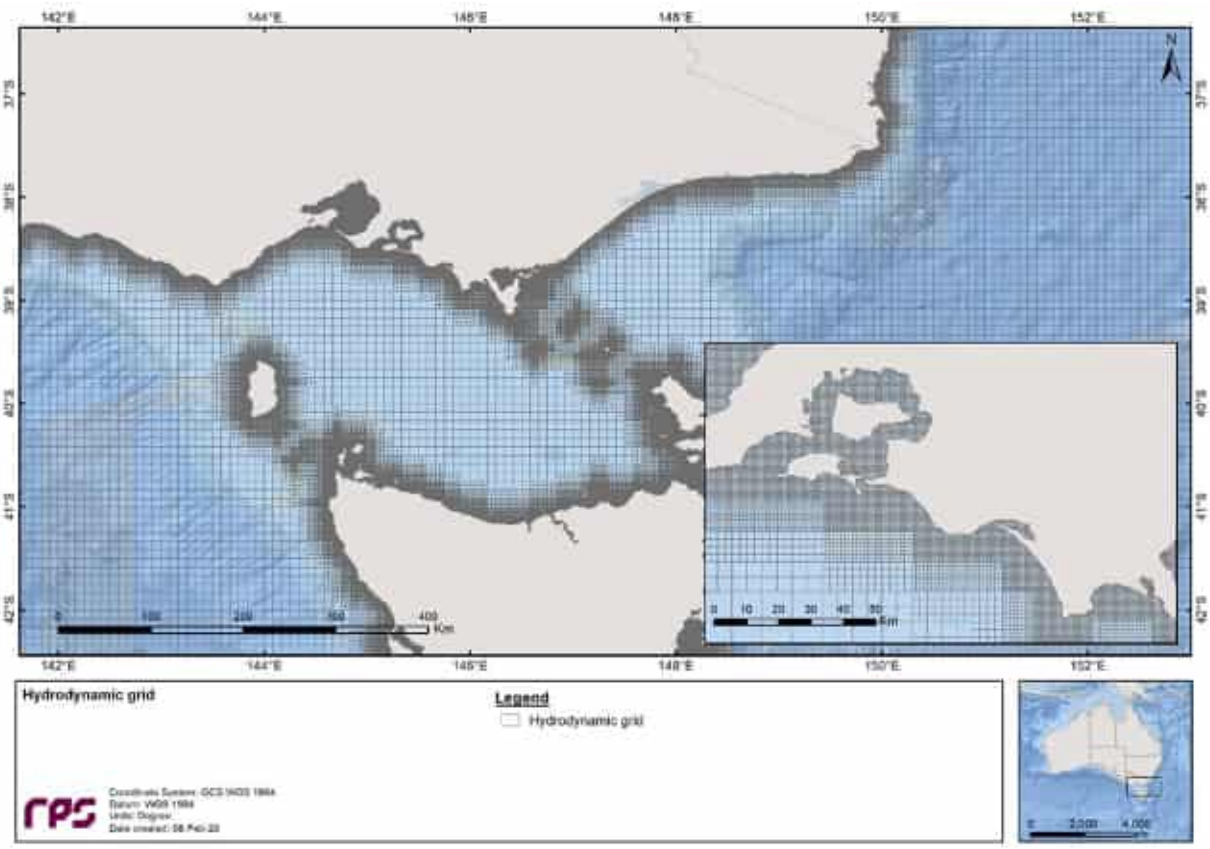


Figure 3.2 **Sample of the model grid used to generate the tidal currents for the study region. Higher resolution areas are shown by the denser mesh.**

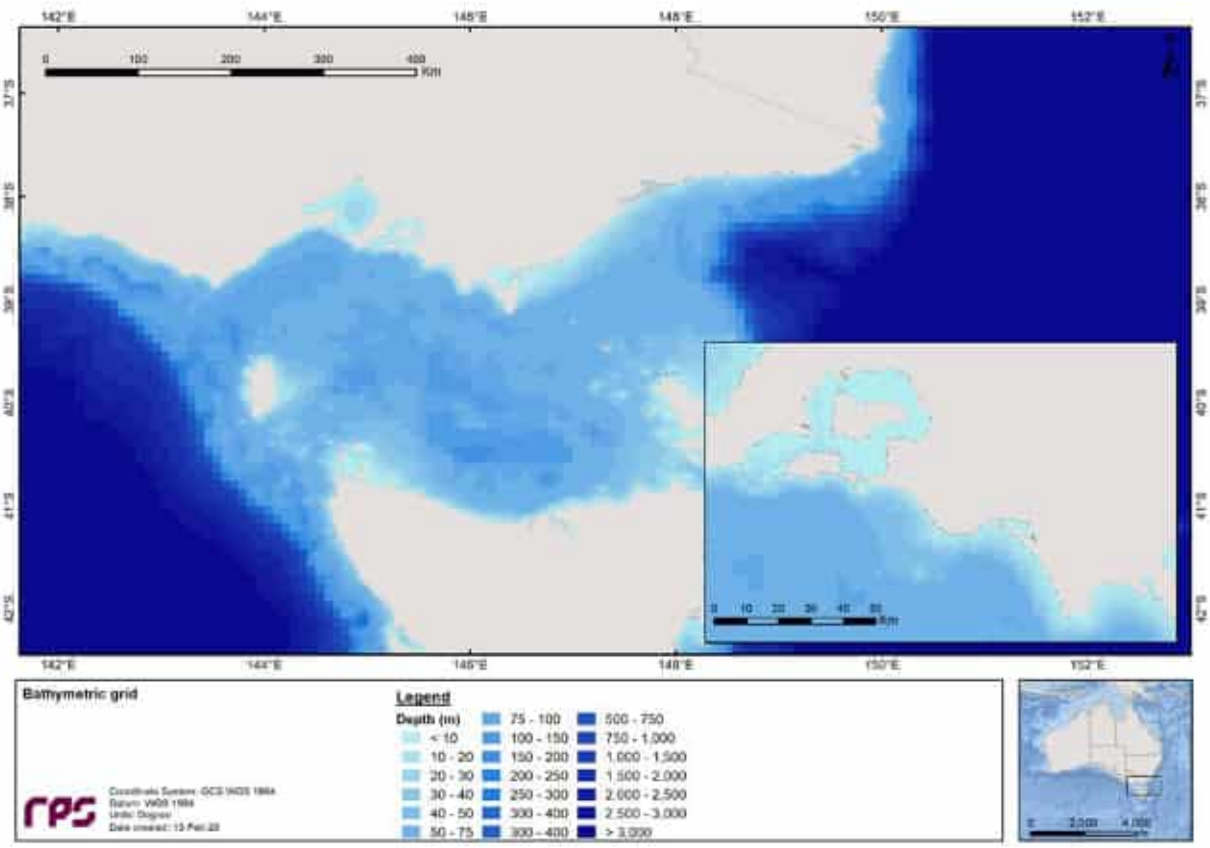


Figure 3.3 **Bathymetry defined throughout the tidal model domain.**

3.1.2 Tidal Conditions

The ocean boundary data for the regional model was obtained from satellite measured altimetry data (TOPEX/Poseidon 7.2) which provides estimates of the eight dominant tidal constituents at a horizontal scale of approximately 0.25 degrees. Using the tidal data, surface heights were firstly calculated along the open boundaries, at each time step in the model. The eight major tidal constituents used were K_2, S_2, M_2, N_2, K_1, P_1, O_1 and Q_1. Using the tidal data, surface heights were firstly calculated along the open boundaries, at each time step in the model.

The TOPEX/Poseidon satellite data is produced and quality controlled by the National Aeronautics and Space Administration (NASA). The satellites, equipped with two highly accurate altimeters that were capable of taking sea level measurements to an accuracy of less than 5 cm, measured oceanic surface elevations (and the resultant tides) for over 13 years (1992–2005; see Fu et al., 1994; NASA 2013a; 2013b). In total these satellites carried out 62,000 orbits of the planet.

The TOPEX/Poseidon tidal data has been widely used amongst the oceanographic community, being cited in more than 2,100 research publications (e.g. Andersen, 1995; Ludicone et al., 1998; Matsumoto et al., 2000, Kostianoy et al., 2003, Yaremchuk & Tangdong, 2004; Qiu & Chen, 2010). As such the Topex/Poseidon tidal data is considered accurate for this study.

To ensure that tidal predictions were accurate, predicted surface elevations were compared to measured data observed at multiple locations.

3.2 Ocean Currents

Data describing the flow of ocean currents was obtained from HYCOM (Hybrid Coordinate Ocean Model), (Chassignet et al., 2007), which is operated by the HYCOM Consortium, sponsored by the Global Ocean Data Assimilation Experiment (GODAE). HYCOM is a data-assimilative, three-dimensional ocean model that is run as a hindcast, assimilating time-varying observations of sea surface height, sea surface temperature and in-situ temperature and salinity measurements (Chassignet et al., 2009). The HYCOM predictions for drift currents are produced at a horizontal spatial resolution of approximately 8.25 km (1/12th of a degree) over the region, at a frequency of once per day. HYCOM uses isopycnal layers in the open, stratified ocean, but uses the layered continuity equation to make a dynamically smooth transition to a terrain-following coordinate in shallow coastal regions, and to z-level coordinates in the mixed layer and/or unstratified seas.

For this study, the HYCOM hindcast current dataset was obtained for the years 2010 to 2019 (inclusive). Figure 3.4 shows the spatial resolution of the HYCOM currents and example speeds and directions for a given time of day.

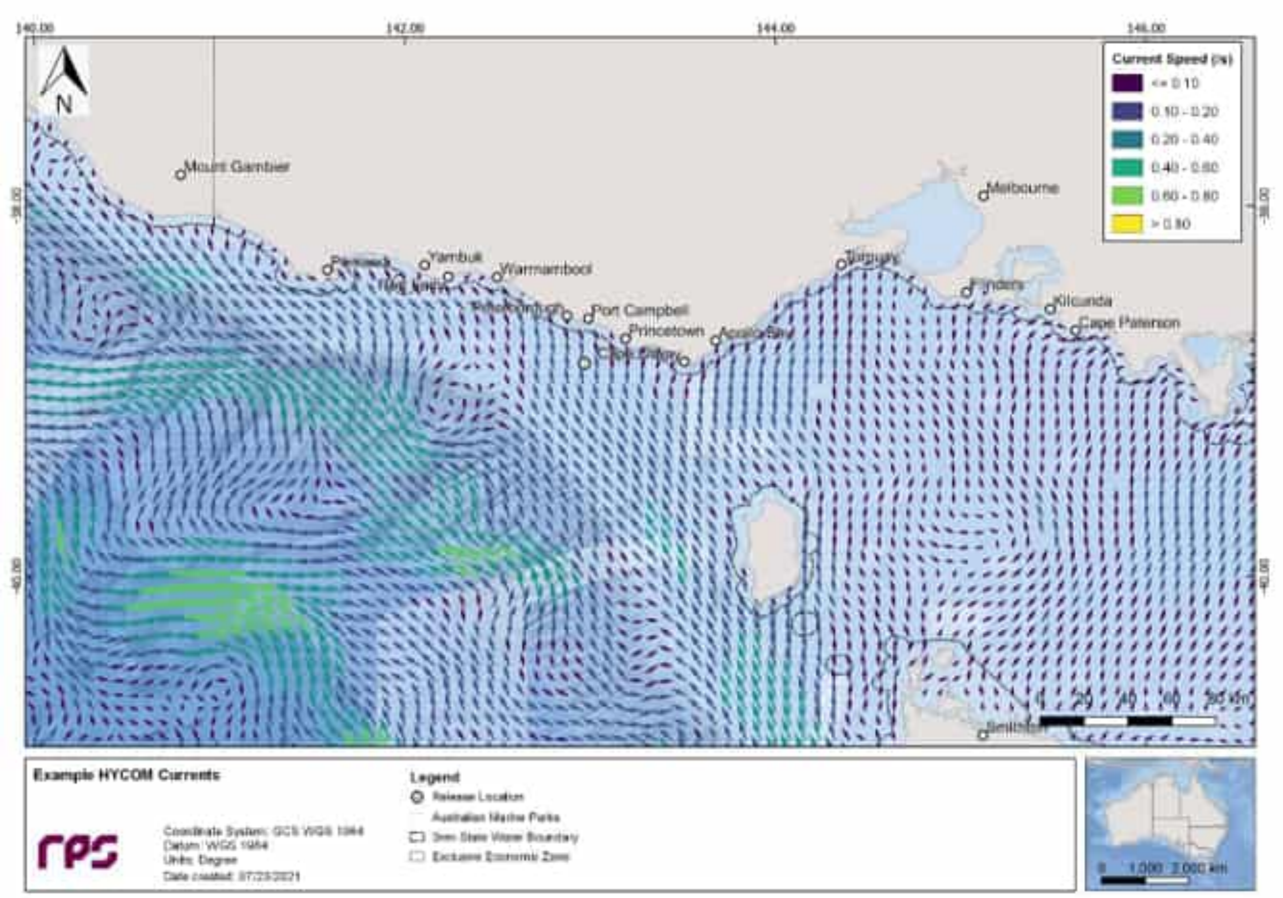


Figure 3.4 Map illustrating the spatial resolution of HYCOM surface ocean currents.

3.3 Surface Currents

Table 3.1 displays the average and maximum surface current speeds within the EP Area. Between March to June the currents generally flowed toward the east and northeast during July and August. The other months, the current directions were more variable. The monthly average speeds ranged between 0.20m/s (January and February) and 0.30 m/s (July). While the maximum speeds were between 0.66 m/s (January) and 1.15 m/s (July).

Figure 3.5 presents the monthly surface current rose distributions within the EP Area from the 2010-2019 dataset. Additionally, Figure 3.6 shows the variability of the annual surface current roses for Release Locations 1–5 and within the EP Area.

Note the convention for defining current direction is the direction the current flows towards, which is used to reference current direction throughout this report. Each branch of the rose represents the currents flowing to that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent the current speed ranges for each direction. Speed intervals of 0.1 m/s are predominantly used in these current roses. The length of each coloured segment is relative to the proportion of currents flowing within the corresponding speed and direction.

Table 3.1 Summary of the predicted average and maximum surface current speeds within the EP Area derived from the 2010 to 2019 modelled dataset.

Month	Average current speed (m/s)	Maximum current speed (m/s)	General Direction (Towards)
January	0.20	0.66	Variable
February	0.20	0.94	Variable
March	0.21	0.77	East
April	0.21	0.75	East
May	0.24	0.74	East
June	0.25	0.71	East
July	0.30	1.15	Northeast
August	0.26	1.00	Northeast
September	0.22	0.82	Variable
October	0.23	0.78	Variable
November	0.24	0.83	Variable
December	0.23	0.85	Variable
Minimum	**0.20**	**0.66**	
Maximum	**0.30**	**1.15**	

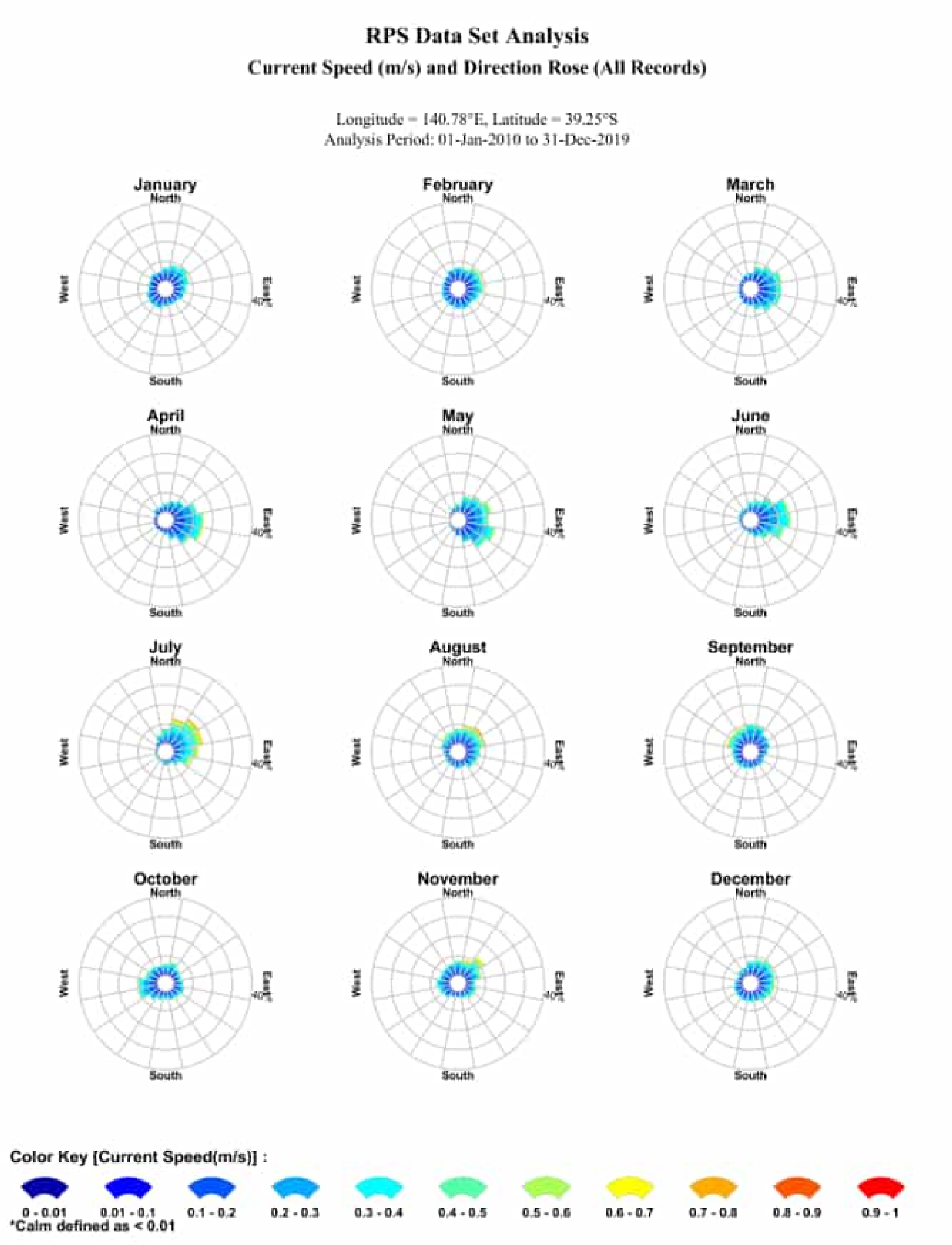


Figure 3.5 Predicted monthly surface current rose plots at the centre of the EP Area. Data was derived from the 2010-2019 data.

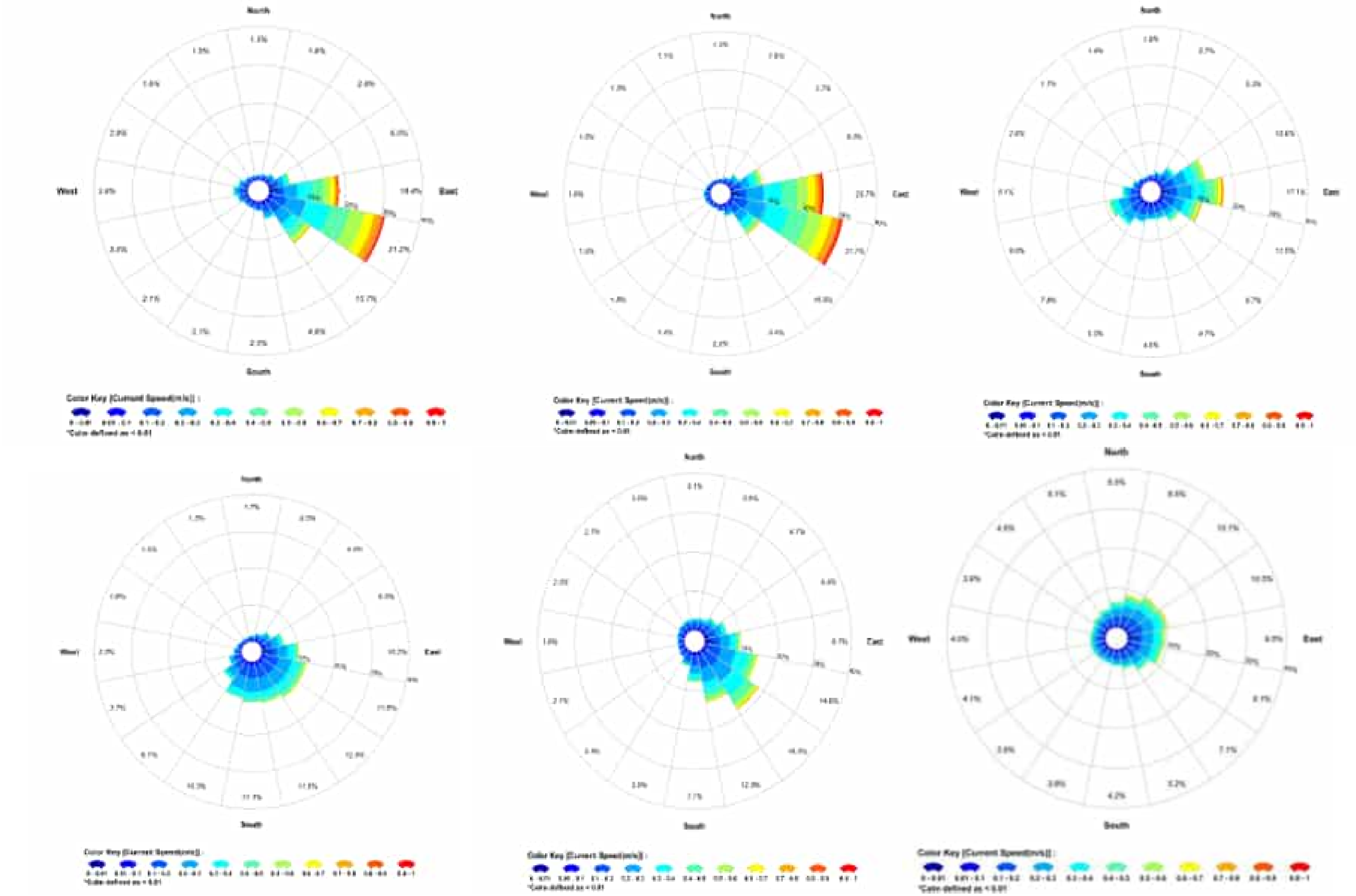


Figure 3.6 Annual surface current rose plots for Release Locations 1 (upper left), 2 (upper centre), 3 (upper right), 4 (lower left), 5 (lower centre) and within the EP Area (lower right). Data was derived by combining the HYCOM large-scale ocean currents and HYDROMAP nearshore tidal currents for 2010-2019 inclusive.

4 WIND DATA

To account for the influence of the wind on the hydrocarbons floating on the surface, wind data from 2010 to 2019 (inclusive) was sourced from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis dataset (CFSR; see Saha et al., 2010). The CFSR wind model includes observations from many data sources: surface observations, upper-atmosphere air balloon observations, aircraft observations and satellite observations. The model is capable of accurately representing the interaction between the earth's oceans, land and atmosphere. The gridded wind data output is available at a horizontal resolution of 0.25° (~33 km) and a temporal resolution of 1 hour.

Figure 4.1 illustrates the spatial resolution of the wind field used as input into the oil spill model.

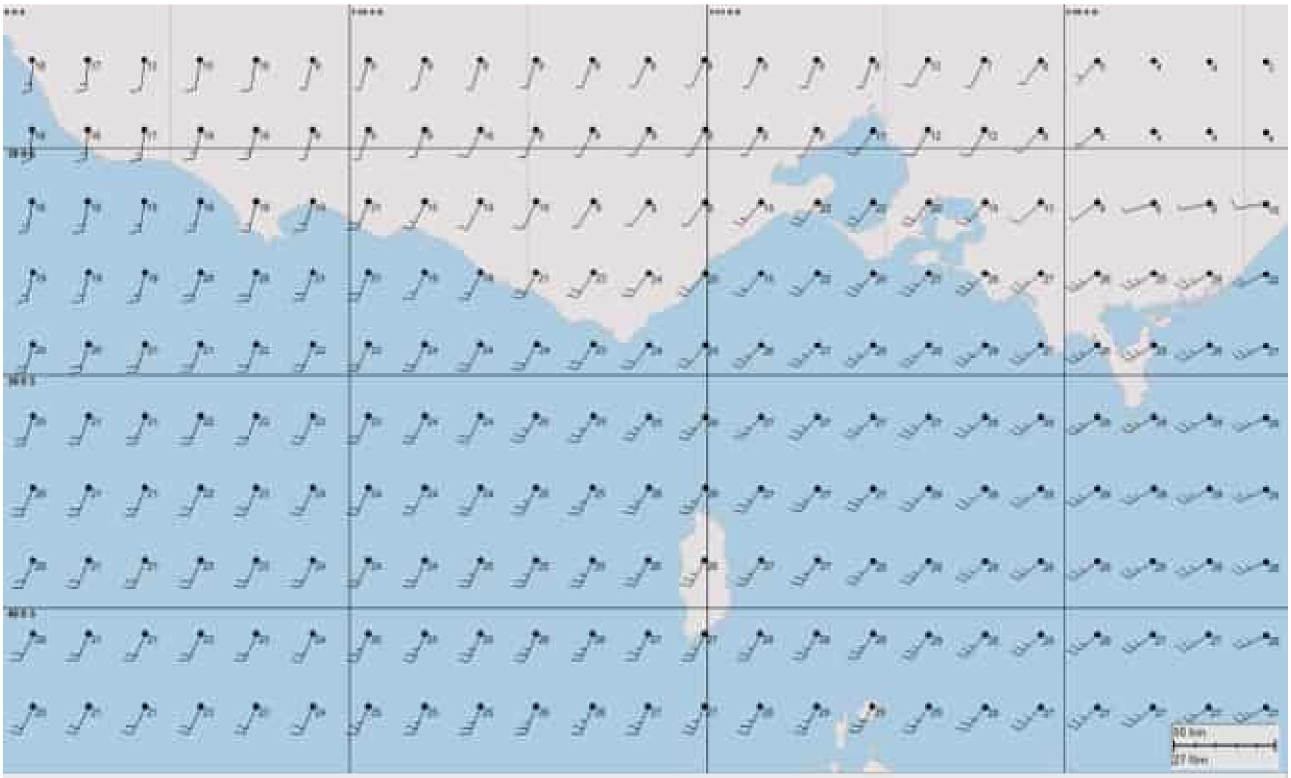


Figure 4.1 Spatial resolution of the CFSR modelled wind data used as input into the oil spill model.

Table 4.1 shows the monthly average and maximum winds within the EP Area. The average monthly wind speed were between 13.5 knots (January) and 19.6 knots (July). The maximum wind speeds reached 51.9 knots in August. Winds were shown to be predominantly from the western sector.

Figure 4.2 shows the monthly wind rose distributions within the EP Area. Additionally, Figure 4.3 illustrates total wind roses for Release Locations 1–5 and within the EP Area.

Note that the atmospheric convention for defining wind direction, that is, the direction the wind blows from, is used to reference wind direction throughout this report. Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent wind speed ranges from that direction. Speed ranges of 5 knots are predominantly used in these wind roses. The length of each segment within a branch is proportional to the frequency of winds blowing within the corresponding range of speeds from that direction.

Table 4.1 Predicted average and maximum wind speeds at the within the EP Area derived from the 2010 to 2019 modelled dataset.

Month	Average wind (knots)	Maximum wind (knots)	General direction (from)
January	13.5	36.0	Southeast and southwest
February	14.0	39.3	Southeast
March	14.3	43.0	West
April	14.3	47.6	West
May	16.6	44.1	West
June	17.3	47.1	West and north
July	19.6	49.4	West
August	19.0	51.9	West
September	17.0	48.4	West
October	16.0	44.3	West
November	14.7	36.8	West
December	14.2	39.2	West and east
Minimum	**13.5**	**36.0**	
Maximum	**19.6**	**51.9**	

Figure 4.2 Monthly wind rose plots in the centre of the EP Area derived from 2010-2019 modelled data.

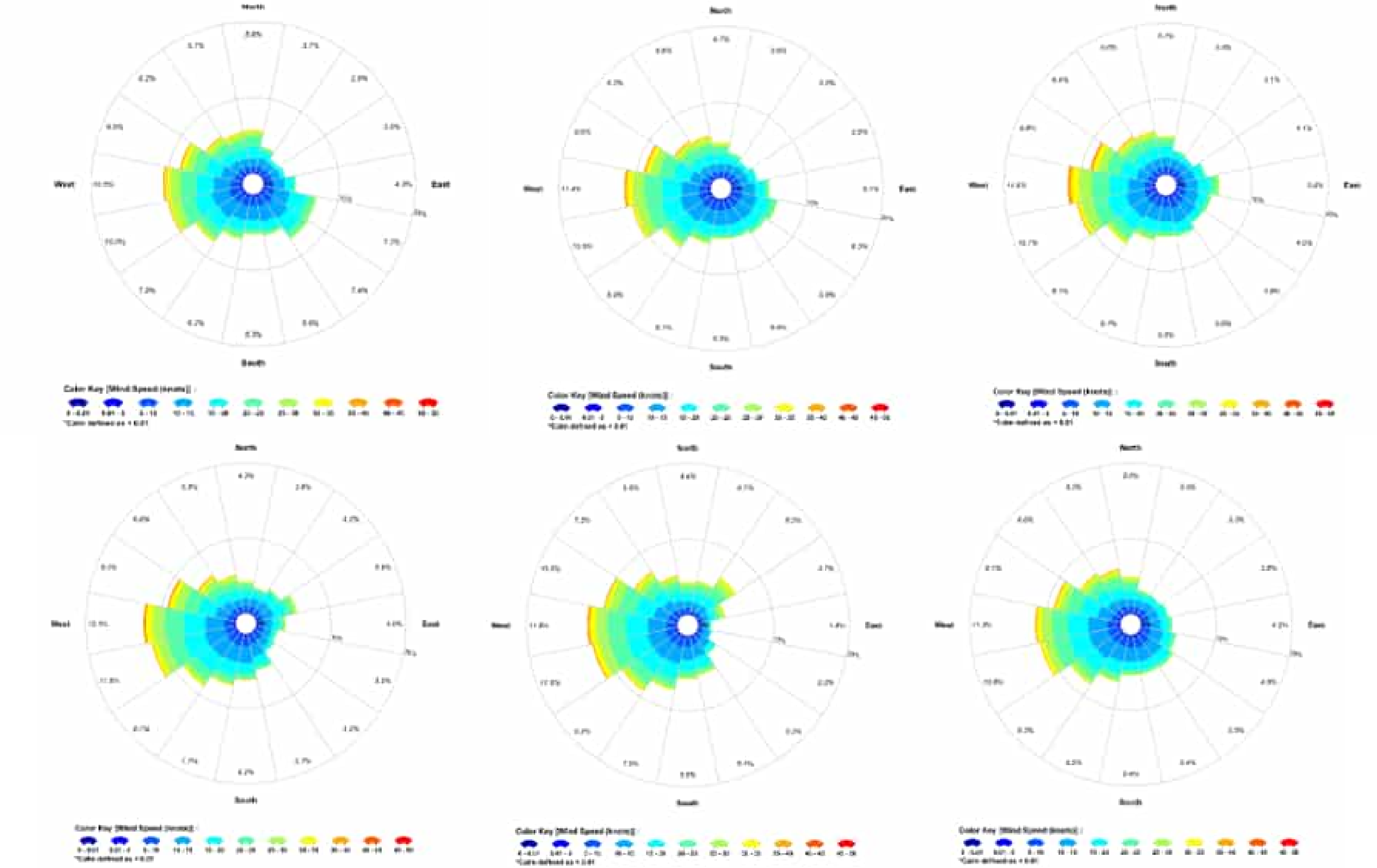


Figure 4.3 Total wind rose plots for Release Locations 1 (upper left), 2 (upper centre), 3 (upper right), 4 (lower left), 5 (lower centre) and within the EP Area (lower right). Derived from 2010-2019 modelled data.

5 WATER TEMPERATURE AND SALINITY

Monthly water temperature and salinity data was obtained from the World Ocean Atlas 2013 database produced by the National Oceanographic Data Centre (National Oceanic and Atmospheric Administration) and its co-located World Data Center for Oceanography (Levitus et al., 2013). The data is used to inform the weathering, movement and evaporative loss of hydrocarbon spills in the surface and subsurface layers.

Table 5.1 presents the sea temperature and salinity of the surface layer (0-5 m) within the EP Area. The monthly average sea surface temperatures ranged between 13.1°C (September) and 17.6°C (March). The monthly average salinity values remained stable around 35.3 psu.

Table 5.1 Monthly average sea surface temperature and salinity within the EP Area.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	17.2	17.2	17.6	16.6	15.7	14.9	14.4	13.8	13.1	13.4	14.0	15.3
Salinity (psu)	35.3	35.4	35.3	35.3	35.3	35.3	35.4	35.4	35.3	35.3	35.4	35.3

6 OIL SPILL MODEL - SIMAP

The spill modelling was carried out using a purpose-developed oil spill trajectory and fates model, SIMAP (Spill Impact Mapping and Assessment Program). This model is designed to simulate the transport and weathering processes that affect the outcomes of hydrocarbon spills to the sea, accounting for the specific oil type, spill scenario, and prevailing wind and current circulation patterns.

SIMAP is the evolution of the United States Environmental Protection Agency (US EPA) Natural Resource Damage Assessment model (French et al., 1999) and is designed to simulate the fate and effects of spilled oils and fuels for both the surface slick and the three-dimensional plume that is generated in the water column. SIMAP includes algorithms to account for both physical transport and weathering processes. The latter are important for accounting for the partitioning of the spilled mass over time between the water surface (surface slick), water column (entrained oil and dissolved compounds), atmosphere (evaporated compounds) and land (stranded oil). The model also accounts for the interaction between weathering and transport processes.

The physical algorithms calculate transport and spreading by physical forces, including surface tension, gravity and wind and current forces for both surface slicks and oil within the water column. The fates algorithms calculate all the weathering processes known to be important for oil spilled to marine waters. These include droplet and slick formation, entrainment by wave action, emulsification, dissolution of soluble components, sedimentation, evaporation, bacterial and photo-chemical decay and shoreline interactions. These algorithms account for the specific oil type being considered.

Entrainment is the physical process where globules of oil are transported from the sea surface into the water column by wind and wave-induced turbulence or be generated subsea by a pressurised discharge at depth. It has been observed that entrained oil is broken into droplets of varying sizes. Small droplets spread and diffuse into the water column, while larger ones rise rapidly back to the surface (Delvigne & Sweeney, 1988; Delvigne, 1991).

Dissolution is the process by which soluble hydrocarbons enter the water from a surface slick or from entrained droplets. The lower molecular weight hydrocarbons tend to be both more volatile and more soluble than those of higher molecular weight.

The formation of water-in-oil emulsions, or mousse, which is termed ‘emulsification’, depends on oil composition and sea state. Emulsified oil can contain as much as 80% water in the form of micrometre-sized droplets dispersed within a continuous phase of oil (Daling & Brandvik, 1991; Bobra, 1991; Daling et al., 1997; Fingas, 1995).

Evaporation can result in the transfer of large proportions of spilled oil from the sea surface to the atmosphere, depending on the type of oil.

Evaporation rates vary over space and time dependent on the prevailing sea temperatures, wind and current speeds, the surface area of the slick and entrained droplets that are exposed to the atmosphere as well as the state of weathering of the oil. Evaporation rates will decrease over time, depending on the calculated rate of loss of the more volatile compounds. By this process, the model can differentiate between the fates of different oil types.

Decay (degradation) of hydrocarbons may occur as the result of photolysis, which is a chemical process energised by ultraviolet light from the sun, and by biological breakdown, termed biodegradation. Many types of marine organisms ingest, metabolise and utilise oil as a carbon source, producing carbon dioxide and water as by-products.

Entrainment, dissolution and emulsification rates are correlated to wave energy, which is accounted for by estimating wave heights from the sustained wind speed, direction and fetch (i.e. distance downwind from land barriers) at different locations in the domain. Dissolution rates are dependent upon the proportion of soluble, short-chained hydrocarbon compounds, and the surface area at the oil/water interface of slicks. Dissolution rates are also strongly affected by the level of turbulence. For example, dissolution rates will be relatively high at the site of the release for a deep-sea discharge at high pressure.

The SIMAP weathering algorithms include terms to represent these dynamic processes. Technical descriptions of the algorithms used in SIMAP and validations against real spill events are provided in French et al. (1999) and French-McCay (2004).

Input specifications for oil types include density, viscosity, pour-point, distillation curve (volume of oil distilled off versus temperature) and the aromatic/aliphatic component ratios within given boiling point ranges. The model calculates a distribution of the oil by mass into the following components:

- Surface-bound or floating oil;
- Entrained oil (non-dissolved oil droplets that are physically entrained by wave action);
- Dissolved hydrocarbons (principally the aromatic and short-chained aliphatic compounds);
- Evaporated hydrocarbons;
- Sedimented hydrocarbons; and
- Decayed hydrocarbons.

6.1 Stochastic Modelling

Stochastic modelling involves running numerous individual oil spill simulations using a range of prevailing wind and current conditions that are historically representative of the season and location of where the spill event may occur. Stochastic oil spill modelling is created by overlaying the simulated hypothetical oil spill results (See Section 1.1.1).

For the stochastic modelling presented herein, 100 simulations were run at each of the 5 selected locations (i.e. 500 simulations total; see Figure 1.1), with each simulation having the same spill information (volume, duration and composition of hydrocarbons) but varying start times. This ensured that each simulation was subjected to a unique set of wind and current conditions.

During each simulation, the model records whether any grid cells are exposed to any oil concentrations, the concentrations involved and the elapsed time before exposure. The results of the oil spill simulations were analysed to determine the following annualised statistics for every grid cell:

- Exposure load (concentrations and volumes);
- Minimum time before exposure;
- Probability of contact above defined concentrations;
- Volume of oil that may strand on shorelines from any single simulation;
- Concentration that might occur on sections of individual shorelines;
- Exposure to dissolved hydrocarbons in the water column; and
- Exposure to entrained hydrocarbons in the water column.

6.2 Floating, Shoreline and In-Water Thresholds

The thresholds and their relationship to exposure for the sea surface, shoreline and water column (entrained and dissolved hydrocarbons) are presented in Sections 6.2.1 to 6.2.3. Supporting justifications of the adopted thresholds applied during the study and additional context relating to the survey area are also provided. It is important to note that the thresholds herein are based on NOPSEMA (2019).

6.2.1 Floating Oil Exposure Thresholds

The modelling results can be presented to any levels; therefore, thresholds have been specified (based on scientific literature) to record floating oil exposure to the sea-surface at meaningful levels only, described in the following paragraphs.

The low threshold to assess the potential for floating oil exposure, was 1 g/m^2, which equates approximately to an average thickness of 1 µm, referred to as visible oil. Oil of this thickness is described as rainbow sheen in appearance, according to the Bonn Agreement Oil Appearance Code (Bonn Agreement, 2009; AMSA, 2014) (see Table 6.1). Figure 6.1 shows photographs highlighting the difference in appearance between a silvery sheen, rainbow sheen and metallic sheen. This threshold is considered below levels which would cause environmental harm and it is more indicative of the areas perceived to be affected due to its visibility on the sea surface and potential to trigger temporary closures of areas (i.e. fishing grounds) as a precautionary measure. Table 6.1 provides a description of the appearance in relation to exposure zone thresholds used to classify the zones of floating oil exposure.

Ecological impact has been estimated to occur at 10 g/m^2 (a film thickness of approximately 10 µm or 0.01 mm) according to French et al. (1996) and French-McCay (2009) as this level of fresh oiling has been observed to mortally impact some birds through adhesion of oil to their feathers, exposing them to secondary effects such as hypothermia. The appearance of oil at this average thickness has been described as a metallic sheen (Bonn Agreement, 2009). Concentrations above 10 g/m^2 is also considered the lower actionable threshold, where oil may be thick enough for containment and recovery as well as dispersant treatment (AMSA, 2015).

Scholten et al. (1996) and Koops et al. (2004) indicated that at oil concentrations on the sea surface of 25 g/m2 (or greater), would be harmful for all birds that have landed in an oil film due to potential contamination of their feathers, with secondary effects such as loss of temperature regulation and ingestion of oil through preening. The appearance of oil at this thickness is also described as metallic sheen (Bonn Agreement, 2009). For this study the high exposure threshold was set to 50 g/m^2 and above based on NOPSEMA (2019). This threshold can also be used to inform response planning.

Table 6.2 defines the thresholds used to classify the zones of floating oil exposure reported herein.

Table 6.1 The Bonn Agreement Oil Appearance Code

Code	Description Appearance	Layer Thickness Interval (g/m2 or µm)	Litres per km2
1	Sheen (silvery/grey)	0.04 – 0.30	40 – 300
2	Rainbow	0.30 – 5.0	300 – 5,000
3	Metallic	5.0 – 50	5,000 – 50,000
4	Discontinuous True Oil Colour	50 – 200	50,000 – 200,000
5	Continuous True Oil Colour	>200	>200,000

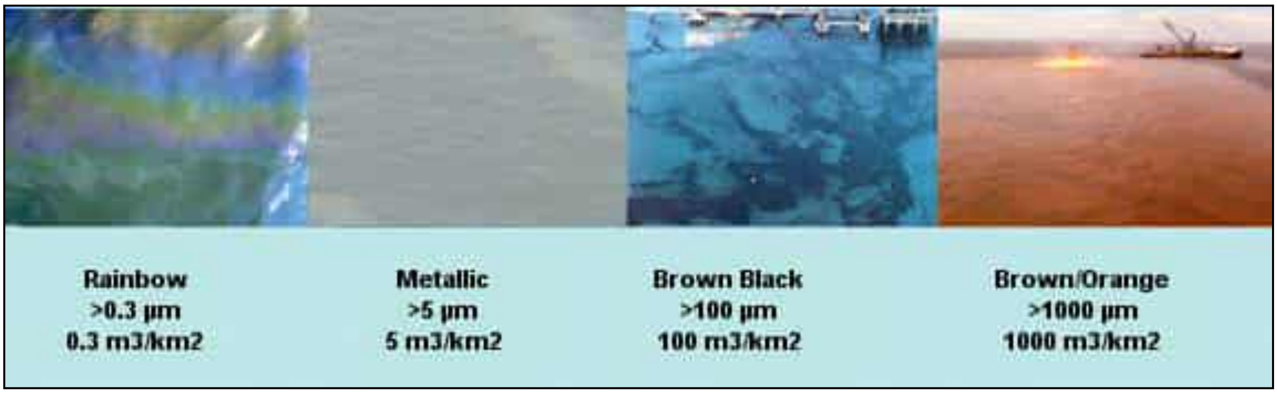


Figure 6.1 Photographs showing the difference between oil colour and thickness on the sea surface (source: Oil Spill Solutions, 2015)

Table 6.2 Floating oil exposure thresholds used in this report (in alignment with NOPSEMA (2019)).

Threshold level	Floating oil g/m^2	Description
Low	1	Approximates range of socioeconomic effects and establishes planning area for scientific monitoring
Moderate	10	Approximates lower limit for harmful exposures to birds and marine mammals
High	50	Approximates surface oil slick and informs response planning

6.2.2 Shoreline Accumulation Thresholds

There are many different types of shorelines, ranging from cliffs, rocky beaches, sandy beaches, mud flats and mangroves, and each of these influences the volume of oil that can remain stranded ashore and its thickness before the shoreline saturation point occurs. For instance, a sandy beach may allow oil to percolate through the sand, thus increasing its ability to hold more oil ashore over tidal cycles and various wave actions than an equivalent area of water; hence oil can increase in thickness onshore over time. A sandy beach shoreline was assumed as the default shoreline type for the modelling herein, as it allows for the highest carrying capacity of oil (of the available open/exposed shoreline types). Hence the results contained herein would be indicative of a worst-case scenario, where the highest volume of oil may be stranded on the shoreline (when compared to other shoreline types, such as exposed rocky shores).

In previous risk assessment studies, French-McCay et al. (2005a; 2005b) used a threshold of 10 g/m^2 to assess the potential for shoreline contact. This is a conservative threshold used to define regions of socio-economic impact, such as triggering temporary closures of adjoining fisheries or the need for shore clean-up on beaches or man-made features/amenities (breakwaters, jetties, marinas, etc.). It would equate to approximately 2 teaspoons of hydrocarbon per square meter of shoreline contacted. The appearance is described as a stain/film. On that basis, the 10 g/m^2 shoreline contact threshold has been selected to define the zone of potential "low shoreline accumulation".

French et al. (1996) and French-McCay (2009) have defined a hydrocarbon exposure threshold for shorebirds and wildlife (furbearing aquatic mammals and marine reptiles) on or along the shore at 100 g/m^2, which is based on studies for sub-lethal and lethal impacts. This threshold has been used in previous environmental risk assessment studies (see French-McCay, 2003; French-McCay et al., 2004; French-McCay et al., 2011; 2012; NOAA, 2013). Additionally, a shoreline concentration of 100 g/m^2, or above, is the minimum limit that the oil can be effectively cleaned according to the AMSA (2015) guideline. This threshold equates to approximately ½ a cup of oil per square meter of shoreline accumulation. The appearance is described as a thin oil coat. Therefore, 100 g/m^2 has been selected to define the zone of potential "moderate shoreline accumulation".

Observations by Lin & Mendelssohn (1996), demonstrated that loadings of more than 1,000 g/m^2 of hydrocarbon during the growing season would be required to impact marsh plants significantly. Similar thresholds have been found in studies assessing hydrocarbon impacts on mangroves (Grant et al., 1993; Suprayogi & Murray, 1999). Hence, 1,000 g/m^2 has been selected to define the zone of potential "high shoreline accumulation". It equates to approximately 1 litre of hydrocarbon per square meter of shoreline accumulation. The appearance is described as a hydrocarbon cover.

It is worth noting that the shoreline accumulation thresholds derived from extensive literature review (outlined in Table 6.3) agree with the commonly used threshold values for oil spill modelling specified in NOPSEMA (2019).

Table 6.3 Shoreline accumulation thresholds used in this report (in alignment with NOPSEMA (2019)).

Threshold level	Shoreline Concentration (g/m2)	Description
Low	10 – 100	Predicts potential for socioeconomic/sublethal impact
Moderate	100 - 1,000	Loading predicts area likely to require clean-up effort
High	> 1,000	Loading predicts area likely to require intensive clean-up effort

6.2.3 In-Water Exposure Thresholds

Oil is a mixture of thousands of hydrocarbons of varying physical, chemical, and toxicological characteristics, and therefore, demonstrate varying fates and impacts on organisms. As such, for in-water exposure, the SIMAP model provides separate outputs for dissolved and entrained hydrocarbons from oil droplets. The consequences of exposure to dissolved and entrained components will differ because they have different modes and magnitudes of effect.

Entrained hydrocarbon concentrations were calculated based on oil droplets that are suspended in the water column, though not dissolved. The composition of this oil would vary with the state of weathering (oil age) and may contain soluble hydrocarbons when the oil is fresh. Calculations for dissolved hydrocarbons specifically calculates oil components which are dissolved in water, which are known to be the primary source of toxicity exerted by oil.

6.2.3.1 Dissolved hydrocarbons

Laboratory studies have shown that dissolved hydrocarbons exert most of the toxic effects of oil on aquatic biota (Carls et al., 2008; Nordtug et al., 2011; Redman, 2015). The mode of action is a narcotic effect, which is positively related to the concentration of soluble hydrocarbons in the body tissues of organisms (French-McCay, 2002). Dissolved hydrocarbons are taken up by organisms directly from the water column by absorption through external surfaces and gills, as well as through the digestive tract. Thus, soluble hydrocarbons are termed “bioavailable”.

Hydrocarbon compounds vary in water-solubility and the toxicity exerted by individual compounds is inversely related to solubility, however bioavailability will be modified by the volatility of individual compounds (Nirmalakhandan & Speece, 1988; Blum & Speece, 1990; McCarty, 1986; McCarty et al., 1992a, 1992b; Mackay & Southwood, 1992; McCarty & Mackay, 1993; Verhaar et al., 1992, 1999; Swartz et al., 1995; French-McCay, 2002; McGrath & Di Toro, 2009). Of the soluble compounds, the greatest contributor to toxicity for water-column and benthic organisms are the lower-molecular-weight aromatic compounds, which are both volatile and soluble in water. Although they are not the most water-soluble hydrocarbons within most oil types, the polynuclear aromatic hydrocarbons (PAHs) containing 2-3 aromatic ring structures typically exert the largest narcotic effects because they are semi-soluble and not highly volatile, so they persist in the environment long enough for significant accumulation to occur (Anderson et al., 1974, 1987; Neff & Anderson, 1981; Malins & Hodgins, 1981; McAuliffe, 1987; NRC, 2003). The monoaromatic hydrocarbons (MAHs), including the BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), and the soluble alkanes (straight chain hydrocarbons) also contribute to toxicity, but these compounds are highly volatile, so that their contribution will be low when oil is exposed to evaporation and higher when oil is discharged at depth where volatilisation does not occur (French-McCay, 2002).

French-McCay (2002) reviewed available toxicity data, where marine biota was exposed to dissolved hydrocarbons prepared from oil mixtures, finding that 95% of species and life stages exhibited 50% population mortality (LC_{50}) between 6 and 400 ppb total PAH concentration after 96 hrs exposure, with an average of 50 ppb. Hence, concentrations lower than 6 ppb total PAH value should be protective of 97.5% of species and life stages even with exposure periods of days (at least 96 hours). Early life-history stages of fish appear to be more sensitive than older fish stages and invertebrates.

Thresholds of 10, 50 or 400 ppb over a 1 hour timestep (see Table 6.4) were applied to indicate increasing potential for sub-lethal to lethal toxic effects (or low to high), based on NOPSEMA (2019).

6.2.3.2 Entrained hydrocarbons

Entrained hydrocarbons consist of oil droplets that are suspended in the water column and insoluble. As such, insoluble compounds in oil cannot be absorbed from the water column by aquatic organisms, hence are not bioavailable through absorption of compounds from the water. Exposure to these compounds would require routes of uptake other than absorption of soluble compounds. The route of exposure of organisms to whole oil alone include direct contact with tissues of organisms and uptake of oil by direct consumption, with potential for biomagnification through the food chain (NRC, 2005).

The 10 ppb threshold represents the very lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARMCANZ (2000) water quality guidelines. Due to the requirement for relatively long exposure times (>24 hours) for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or trapped against a shoreline for periods of several days or more.

This exposure zone is not considered to be of significant biological impact and is therefore outside the adverse exposure zone. This exposure zone represents the area contacted by the spill. This area does not define the area of influence as it is considered that the environment will not be affected by the entrained hydrocarbon at this level.

Thresholds of 10 ppb and 100 ppb were applied over a 1 hour time exposure (Table 6.4), to cover the range of thresholds outlined in ANZECC& ARMCANZ, (2000) water quality guidelines, the incremental change for greater potential effect and is per NOPSEMA (2019).

A complicating factor that should be considered when assessing the consequence of dissolved and entrained oil distributions is that there will be some areas where both physically entrained oil droplets and dissolved hydrocarbons co-exist. Higher concentrations of each will tend to occur close to the source where sea conditions can force mixing of relatively unweathered oil into the water column, resulting in more rapid dissolution of soluble compounds.

Table 6.4 Dissolved and entrained hydrocarbon exposure values assessed over a 1-hour time step (in alignment with NOPSEMA (2019)).

Phase	Exposure level	In-water threshold (ppb)	Description
Dissolved hydrocarbons	Low	10	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers
	Moderate	50	Approximates potential toxic effects, particularly sublethal effects to sensitive species
	High	400	Approximates toxic effects including lethal effects to sensitive species
Entrained hydrocarbons	Low	10	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers
	High	100	As appropriate given oil characteristics for informing risk evaluation

6.3 Dispersion

A horizontal dispersion coefficient of 10 m^2/s was used to account for dispersive processes acting at the surface that are below the scale of resolution of the input current field, based on typical values for open waters (Okubo, 1971). Dispersion rates within the water column (applicable for entrained and dissolved plumes of hydrocarbons) were specified at 1 m^2/s, based on empirical data for the dispersion of hydrocarbon plumes (King & McAllister, 1998).

7 OIL PROPERTIES

Table 7.1 and Table 7.2 present the physical properties and boiling point ranges of the MDO used in this study.

MDO is a light-persistent fuel oil used in the maritime industry. It has a density of 829.1 kg/m^3 (API of 37.6) and a low pour point of -14°C. The low viscosity (4 cP) indicates that this oil will spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation.

Generally, 6.0% of the MDO mass should evaporate within the first 12 hours (BP < 180°C); a further 34.6% should evaporate within the first 24 hours (180°C < BP < 265°C); and an additional 54.4% should evaporate over several days (265°C < BP < 380°C). Approximately 5% (by mass) of MDO will not evaporate at ambient temperatures and persist in the environment.

The oil is categorised as a group II oil (light-persistent) based on categorisation and classification derived from AMSA (2015a) guidelines. The classification is based on the specific gravity of hydrocarbons in combination with relevant boiling point ranges.

It is important to note that some heavy components contained in MDO have a strong tendency to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but can re-float to the surface if these energies abate.

Table 7.1 Physical properties of the MDO.

Characteristic	Marine Diesel Oil (MDO
Density (kg/m^3)	829.1 (at 25 °C)
API	37.6
Dynamic viscosity (cP)	4.0 (at 25 °C)
Pour point (°C)	-14
Hydrocarbon property category	Group II
Hydrocarbon property classification	Light - Persistent

Table 7.2 Boiling point ranges of the MDO.

Oil Type	Component	Volatile (%)	Semi-volatile (%)	Low-volatility (%)	Residual (%)
	Boiling point (°C)	<180 C_4 to C_{10}	180-160 C_{11} to C_{15}	160-380 C_{16} to C_{20}	>380 $>C_{20}$
MDO	% of total	6.0	34.6	54.4	5.0

8 MODEL SETTINGS

Table 8.1 provides a summary of the oil spill model settings and the thresholds used.

The simulation length was carefully selected based on extensive sensitivity testing. During the sensitivity testing process, sample spill simulations were run for longer than intended durations. Upon completion of the spill simulations, the results were carefully assessed to examine the persistence of the hydrocarbon (i.e. whether the maximum evaporative loss has been achieved for the period of time modelled; and whether a substantial volume of hydrocarbons remain in the water column (if any)) in conjunction with the extent of floating oil exposure based on reporting thresholds. Once there was agreement between the two factors (i.e. the final fate of hydrocarbon is accounted for and the full exposure area is identified) the simulation length was deemed appropriate.

Table 8.1 Summary of the oil spill model settings used in this assessment.

Parameter	Vessel Collision Incident
Total number of spill simulations completed for the study	500
Assessment period	Annual
Oil Type	MDO
Spill Volume (m^3)	1,066
Release Type	Surface
Release duration (hrs)	6
Simulation length (days)	50
Floating oil exposure thresholds (g/m^2)	1 (low exposure) 10 (moderate exposure) 50 (high exposure)
Shoreline accumulation thresholds (g/m^2)	10 (low potential exposure) 100 (moderate potential exposure) 1,000 (high potential exposure)
Dissolved hydrocarbon exposure thresholds (ppb)	10 (10 ppb x 1 hr, potential low exposure) 50 (50 ppb x 1 hr, potential moderate exposure) 400 (400 ppb x 1 hr, potential high exposure)
Entrained hydrocarbon exposure thresholds (ppb)	10 (10 ppb x 1 hr, potential low exposure) 100 (100 ppb x 1 hr, potential high exposure)

9 CALCULATION OF EXPOSURE RISK

The stochastic sampling approach provides an objective measure of the possible outcomes of a spill because randomly selected environmental conditions with more simulations will tend to use the most commonly occurring conditions, while more unusual conditions will be represented less frequently.

During each simulation, the SIMAP model records the location (by latitude, longitude and depth) of each of the particles (representing a given mass of oil) on or in the water column, at regular time steps. For any particles that contact a shoreline, the model records the accumulation of oil mass that arrives on each section of shoreline over time, less any mass that is lost to evaporation and/or subsequent removal by current and wind forces.

The collective records from all simulations are then analysed by dividing the study region into a three-dimensional grid. For oil particles that are classified as being at the water surface (floating oil), the sum of the mass in all oil particles (including accounting for spreading and dispersion effects) located within a grid cell, divided by the area of the cell provides estimates of the concentration of oil in that grid cell, at each time step. For entrained and dissolved hydrocarbons particles, concentrations are calculated at each time step by summing the mass of particles within a grid cell and dividing by the volume of the grid cell.

The concentrations of oil calculated for each grid cell, at each time step, are then analysed to determine whether concentration estimates exceed defined threshold concentrations over time.

Risks are then summarised as follows:

- The probability of exposure to a location is calculated by dividing the number of spill simulations where any contact occurred above a specified threshold at that location by the total number of replicate spill simulations. For example, if contact occurred at a location (above a specified threshold) during 21 out of 100 simulations, a probability of exposure of 21% is indicated;

- The minimum potential time to a shoreline location is calculated by the shortest time over which oil at a concentration above a threshold was calculated to travel from the source to the location in any of the replicate simulations;

- The maximum potential concentration of oil predicted for each shoreline section is the greatest mass per m^2 of shoreline calculated to strand at any location within that section during any of the replicate simulations; and

- Similar treatments were undertaken for entrained and dissolved hydrocarbon exposures.

Thus, the minimum time to shoreline and the maximum potential concentration estimates indicate the worst potential outcome of the modelled spill scenario for each section of shoreline. However, the average over the replicates presents an average of the potential outcomes, in terms of hydrocarbons that could strand.

Note also that results quoted for sections of shoreline are derived for any individual location within that section, as a conservative estimate. Locations will represent shoreline lengths of the order of ~1 km, while sections or regions will represent shorelines spanning tens to hundreds of kilometres. The maximum potential concentrations quoted will not necessarily occur over the full extent of each section, therefore multiplying the maximum concentration estimates by the full area of the section is not recommended as this will greatly overestimate the total volume expected on that section.

10 INTERPRETING MODEL RESULTS

The results from the modelling study are presented in a number of tables and figures, which aim to provide an understanding of the predicted sea-surface and water column (subsurface) exposure and shoreline accumulation (if predicted).

10.1 Stochastic Analysis

The statistics are based on the following principles:

- The ***greatest distance travelled by a spill trajectory*** – is determined by a) recording the maximum and b) second greatest distance travelled (or 99th percentile) by a single simulation, within a scenario, from the release location to the identified exposure thresholds.
- The ***probability of oil exposure to a receptor*** – is determined by recording the number of spill trajectories to reach a specified sea surface or subsea threshold within a receptor polygon, divided by the total number of spill trajectories within that scenario.
- The ***minimum time before oil exposure to a receptor*** – is determined by ranking the elapsed time before sea surface exposure, at a specified threshold, to grid cells within a receptor polygon and recording the minimum value.
- The ***probability of oil accumulation at a receptor*** – is determined by recording the number of spill trajectories to reach a specified shoreline accumulation threshold within a receptor polygon, divided by the total number of spill trajectories.
- The ***maximum potential oil loading within a receptor*** – is determined by identifying the maximum loading to any grid cell within a receptor polygon.
- The ***dissolved and entrained hydrocarbon exposure*** – is determined by recording the maximum instantaneous concentrations to any grid cell within a receptor polygon.

10.2 Receptors Assessed

A range of environmental receptors and shorelines were assessed for floating oil exposure, shoreline contact and water column exposure (entrained and dissolved hydrocarbons) as part of the study (see Figure 10.1 to Figure 10.13). Receptor categories are shown in Table 10.1 which includes coastal and offshore islands grouped as shorelines. All other sensitive receptors other than submerged reefs, shoals and banks (RSB) were sourced from Australian Government Department of Agriculture, Water and the Environment (http://www.environment.gov.au/). Probabilities of exposure were separately calculated for each sensitive receptor area and have been tabulated.

Table 10.1 Summary of receptors assessed for potential oil exposure.

Receptor Category	Acronym	Hydrocarbon Exposure and Accumulation Assessment		
		Floating oil	Water Column	Shoreline
Australian Marine Park	AMP	✓	✓	✗
Conservation Park	CP	✓	✓	✗
Interim Biogeographic Regionalisation for Australia bioregions	IBRA	✓	✓	✗
Integrated marine and coastal regionalisation areas	IMCRA	✓	✓	✗
Marine Park	MP	✓	✓	✗
Marine Sanctuary	MS	✓	✓	✗
National Park	NP	✓	✓	✗
National Parks Act Schedule 4 park or reserve	NPS4	✓	✓	✗
Nature Reserve	NR	✓	✓	✗
Ramsar Sites	Ramsar	✓	✓	✗
Reefs, Shoals and Banks	RSB	✓	✓	✗
Key Ecological Feature	KEF	✓	✓	✗
State Waters	State Waters	✓	✓	✗
Shorelines	Shore	✓ (Reported as: Nearshore Waters)	✓ (Reported as: Nearshore Waters)	✓

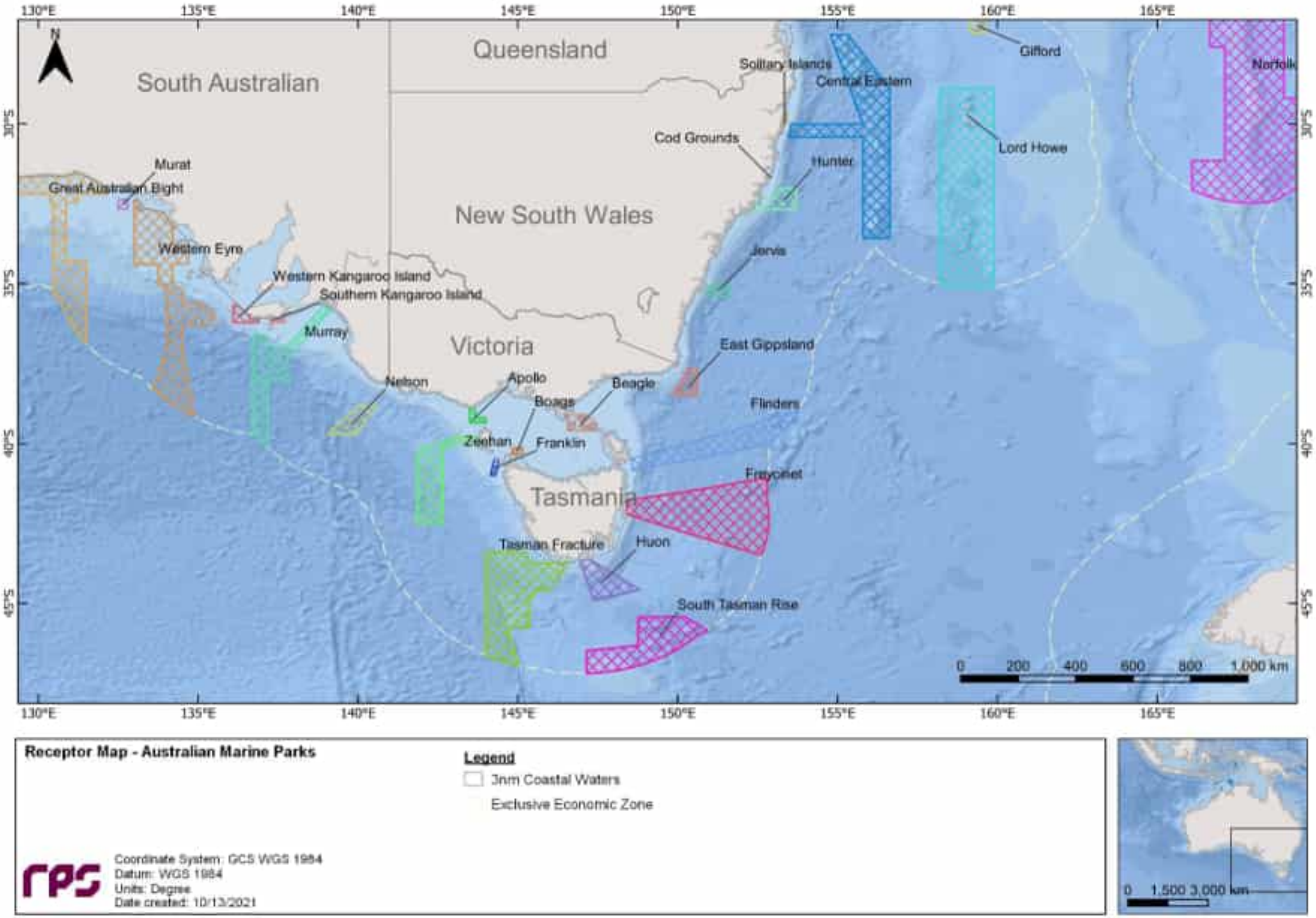


Figure 10.1 Receptor map for Australian Marine Parks (AMP).

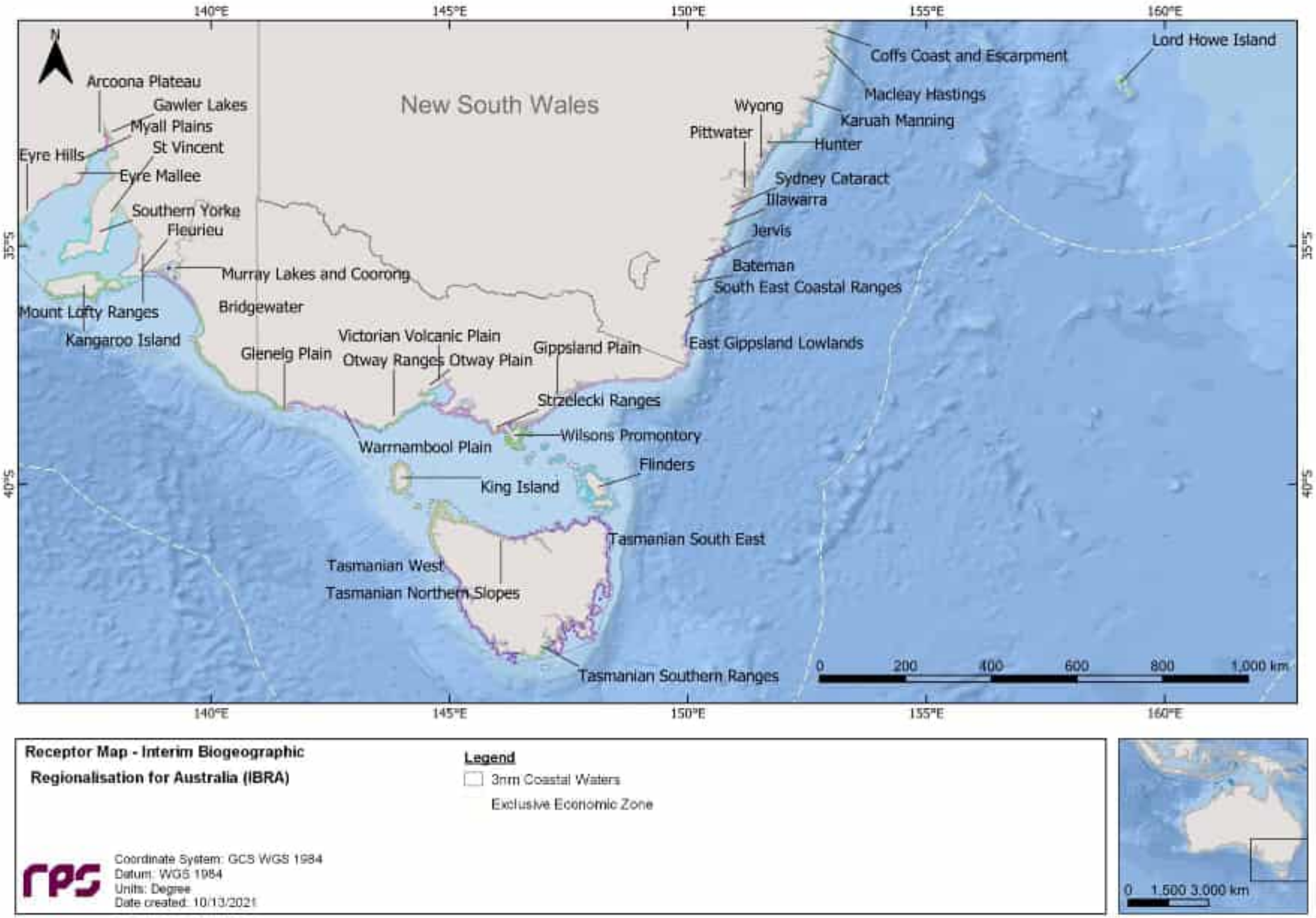


Figure 10.2 Receptor map for the Interim Biogeographic Regionalisation for Australia (IBRA) bioregions.

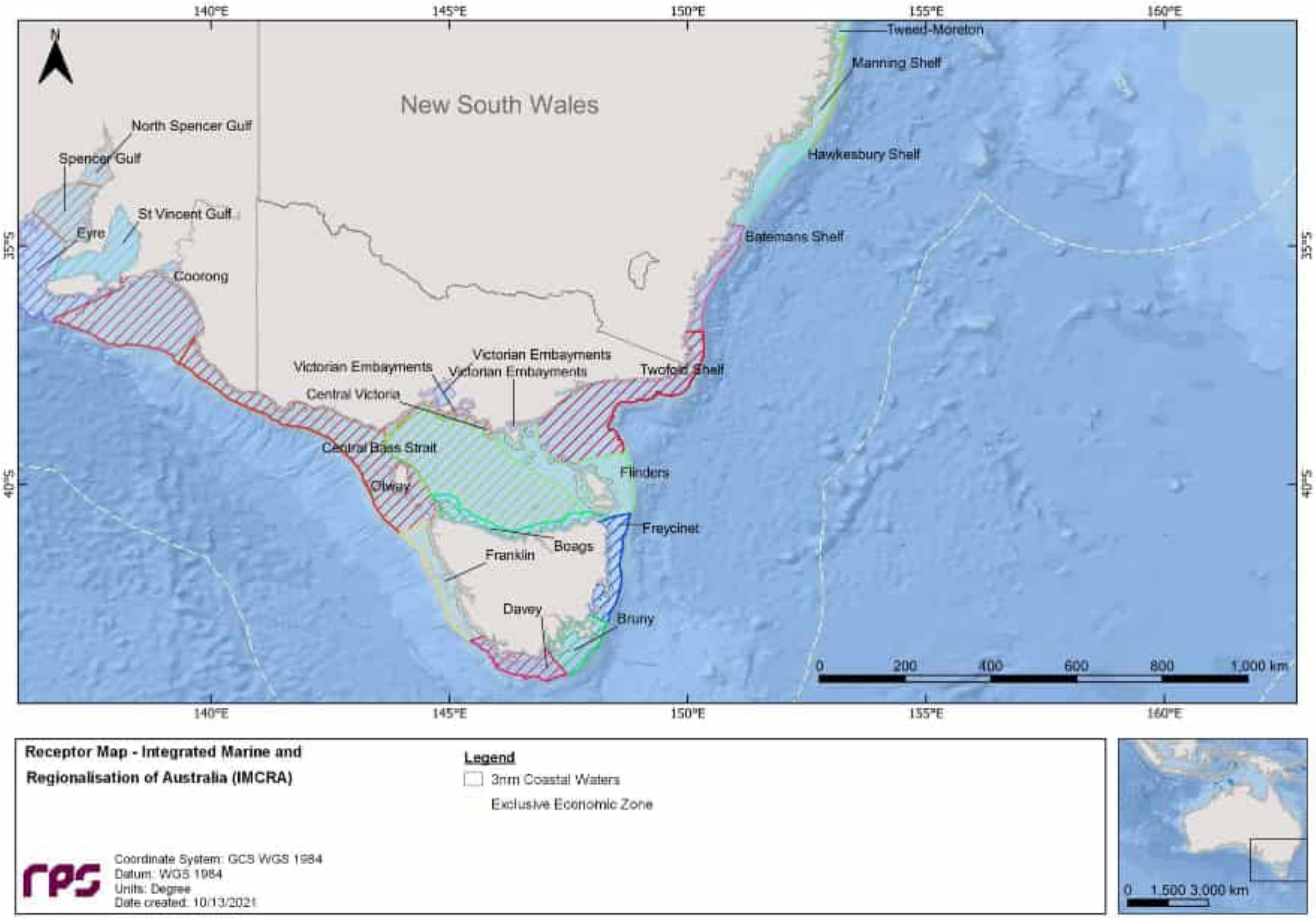


Figure 10.3 Receptor map for integrated marine and coastal regionalisation (IMCRA) areas.

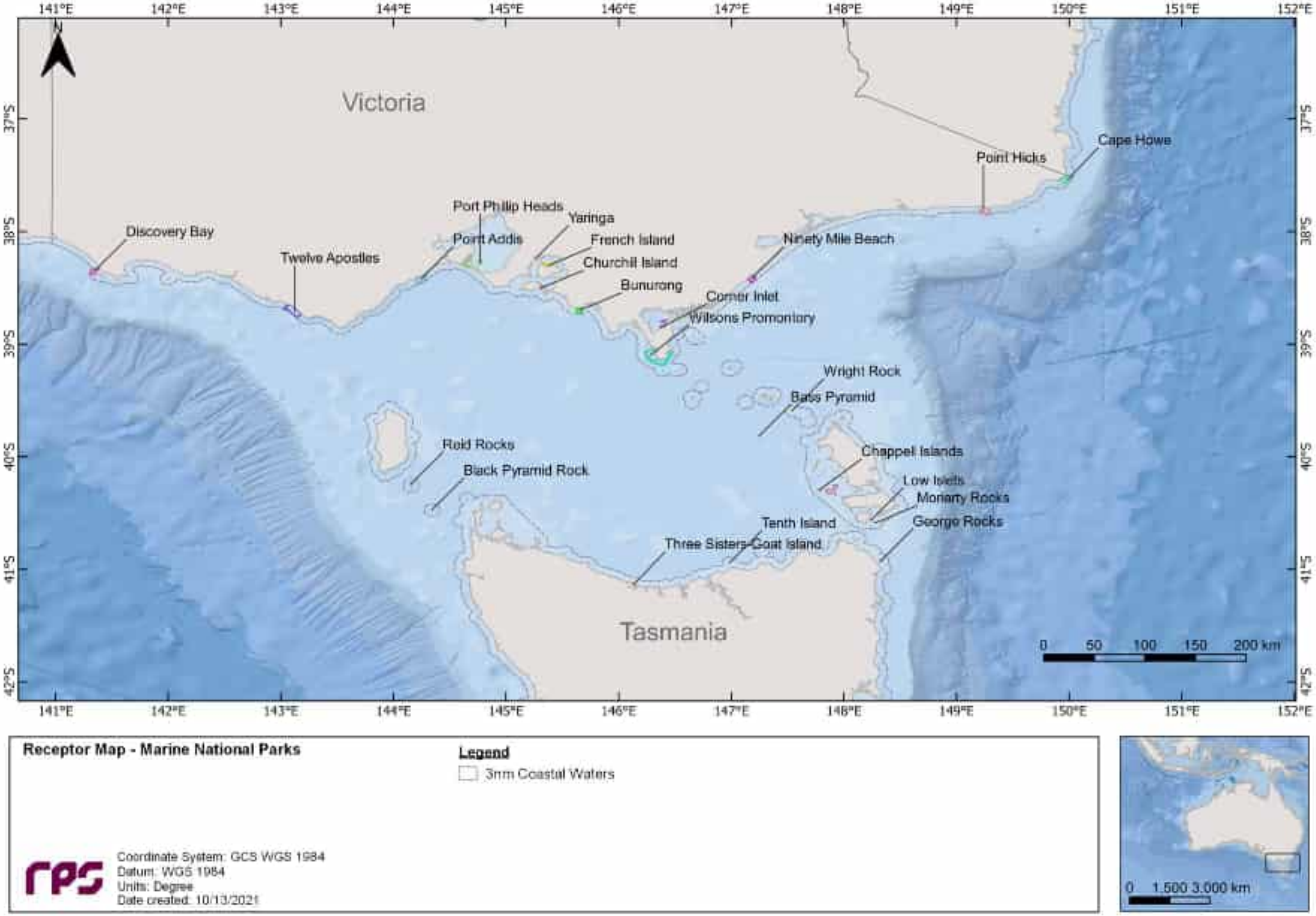


Figure 10.4 Receptor map for Marine Parks (MP).

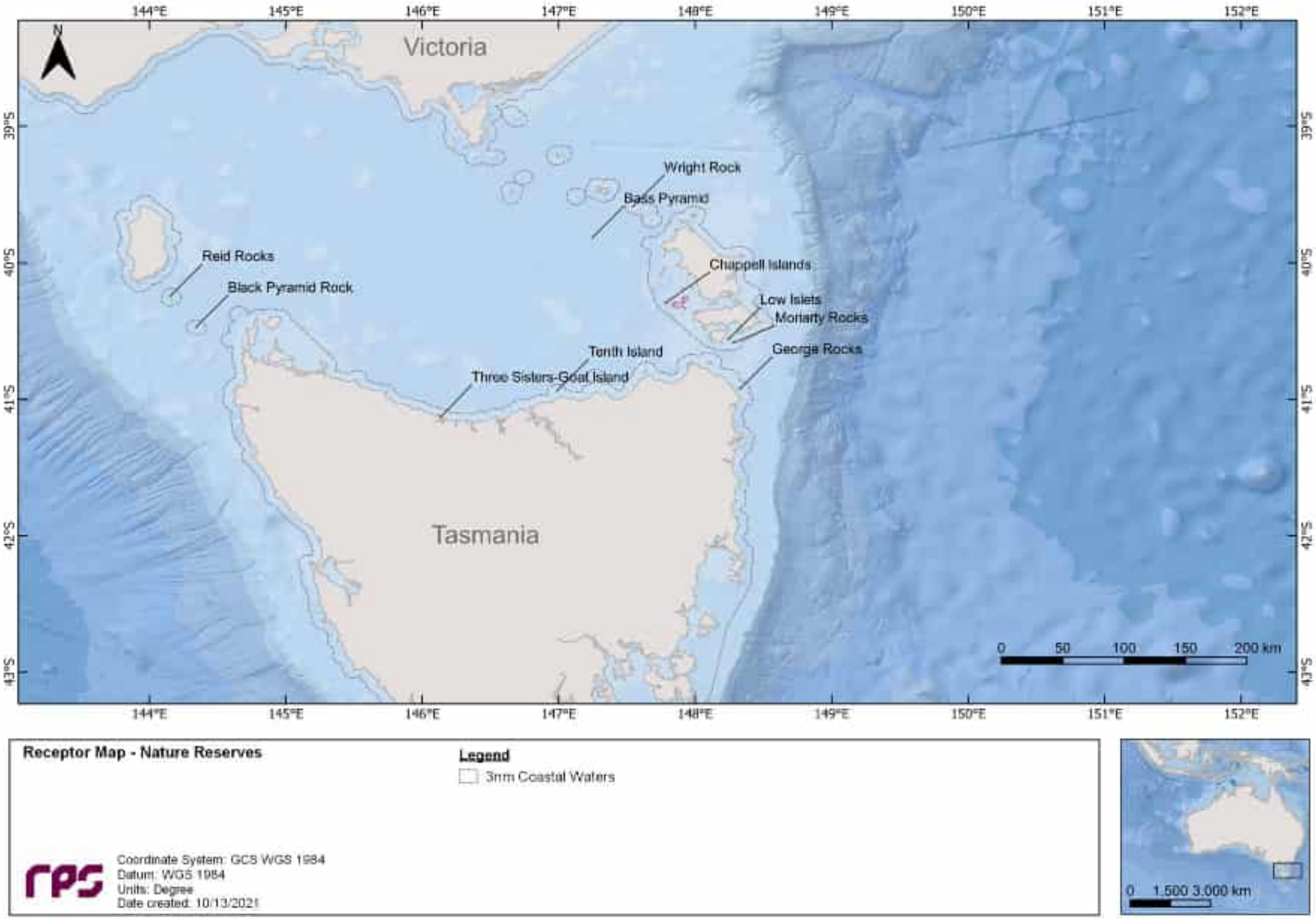


Figure 10.5 Receptor map for Nature Reserves (NR).

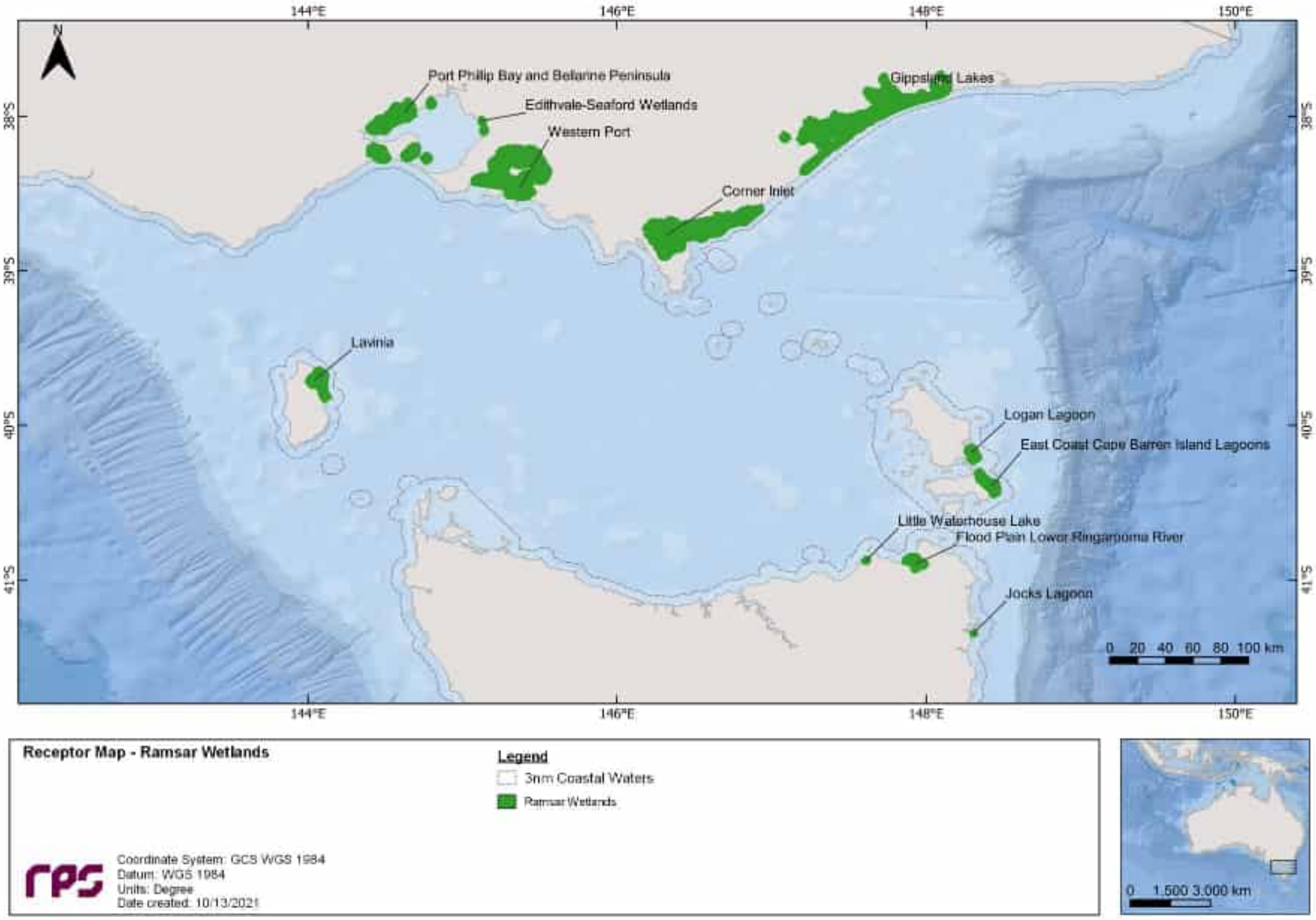


Figure 10.6 Receptor map for Ramsar Sites (Ramsar).

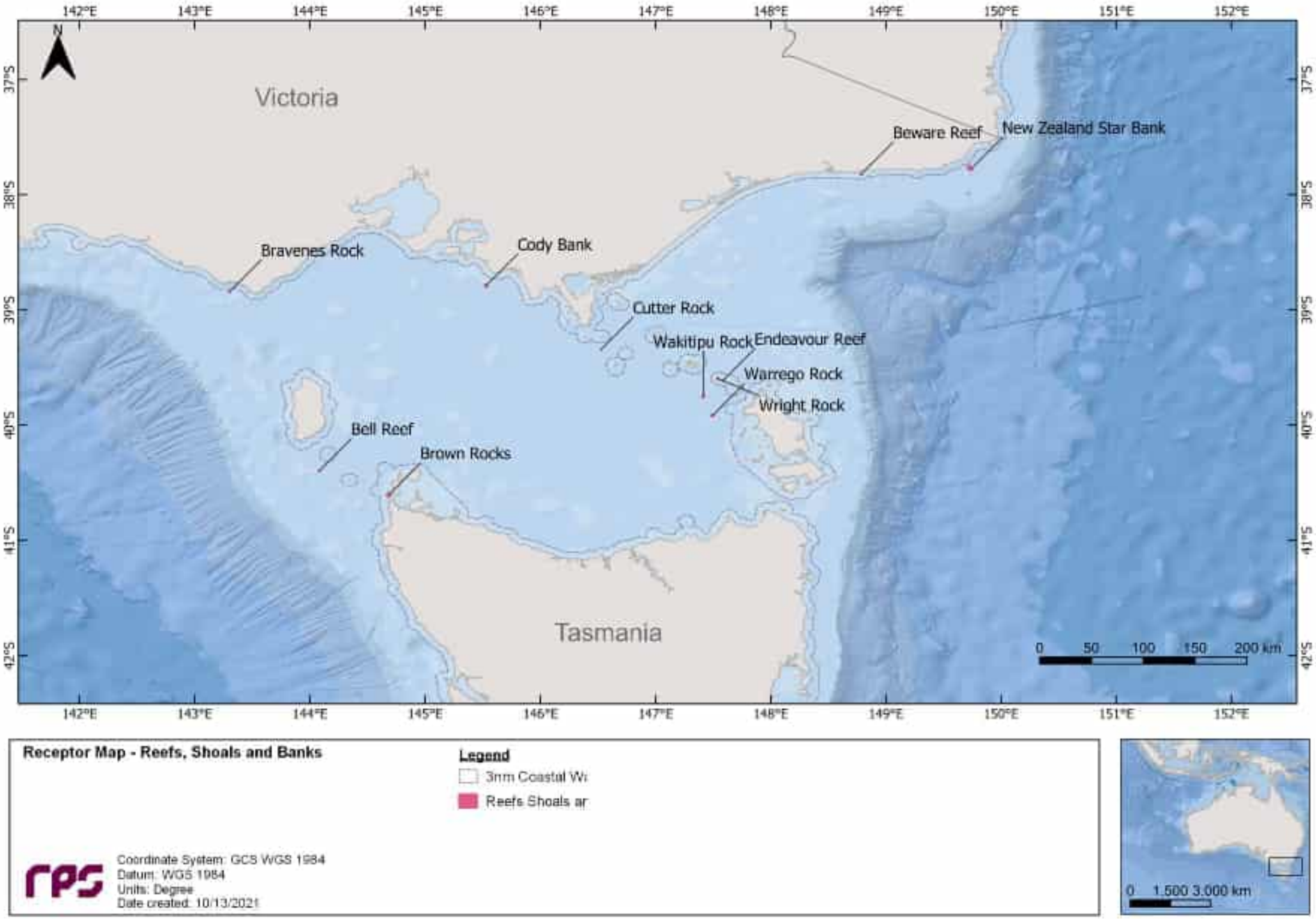


Figure 10.7 Receptor map for Reefs, Shoals and Banks (RSB).

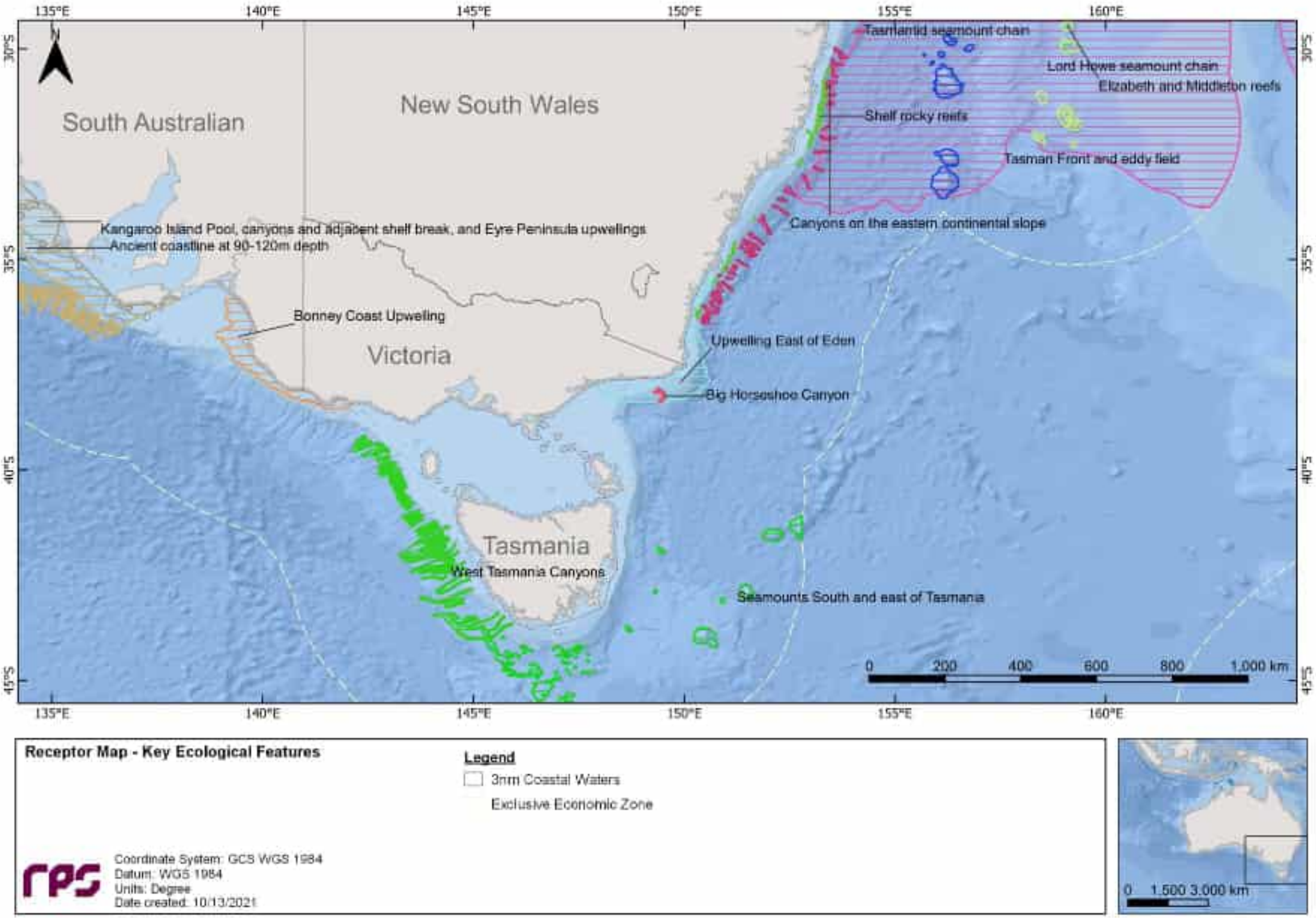


Figure 10.8 Receptor map for Key Ecological Features (KEF).

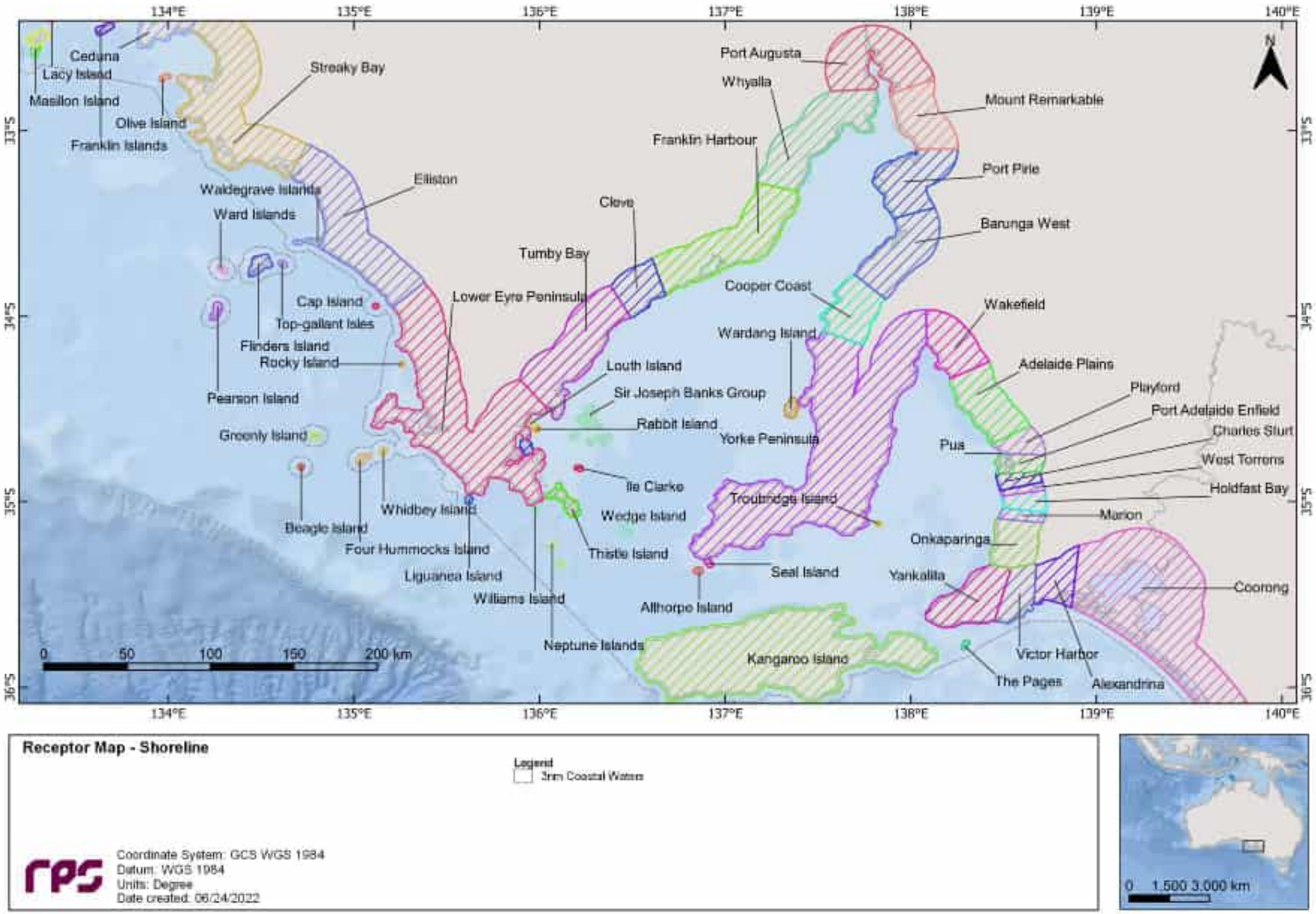


Figure 10.9 Receptor map for shorelines (1 of 5).

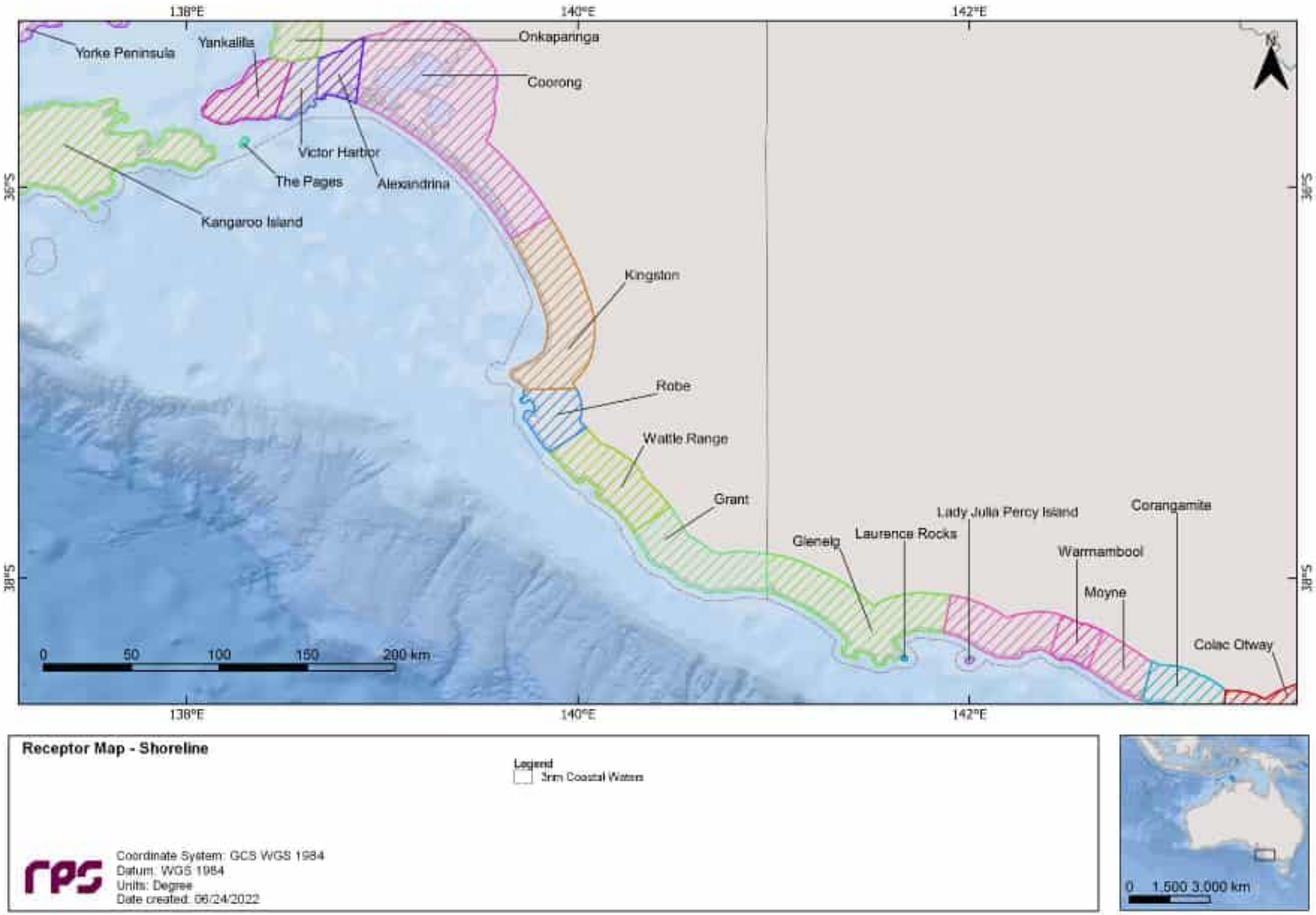


Figure 10.10 Receptor map for shorelines (2 of 5).

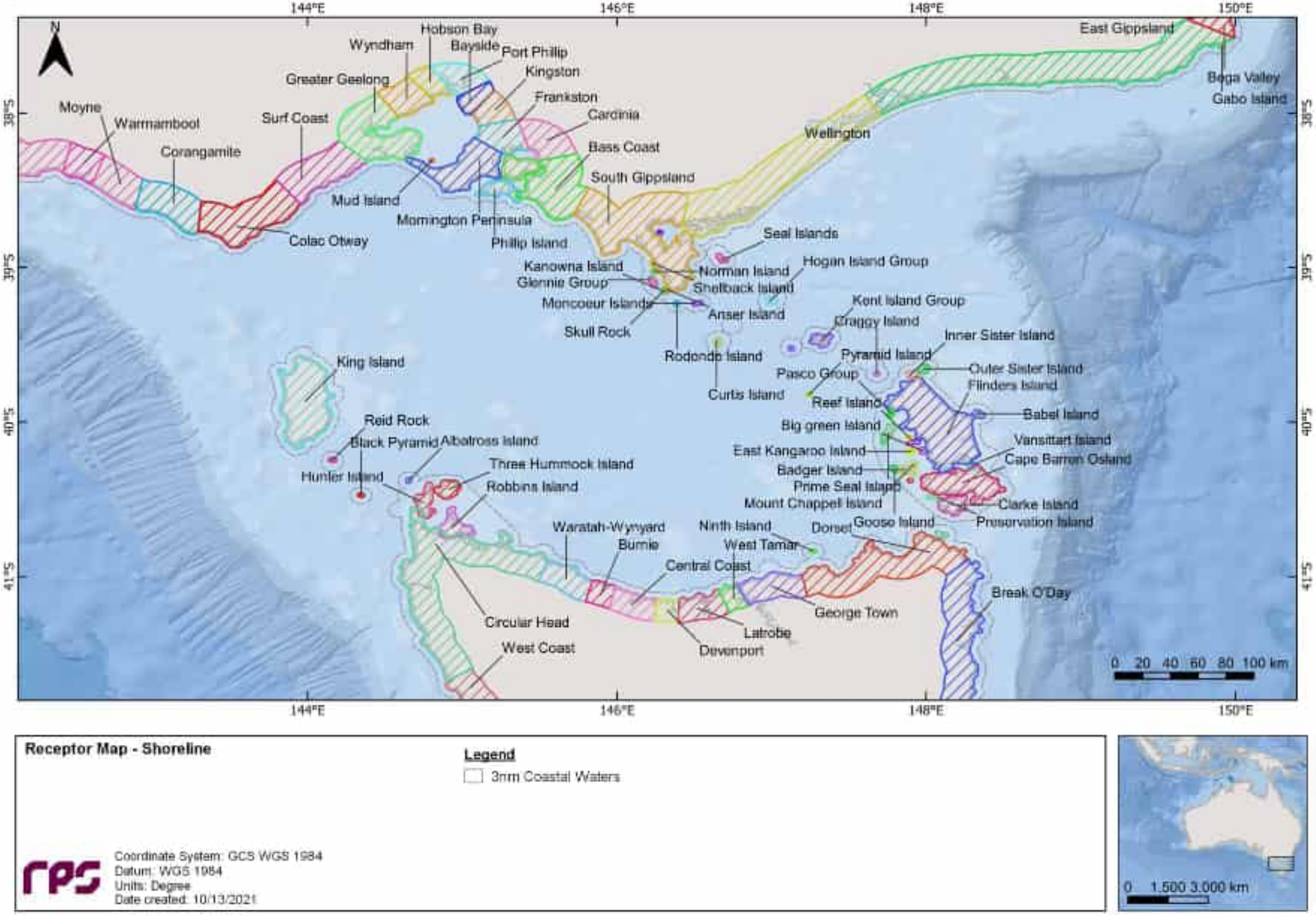


Figure 10.11 Receptor map for shorelines (3 of 5).

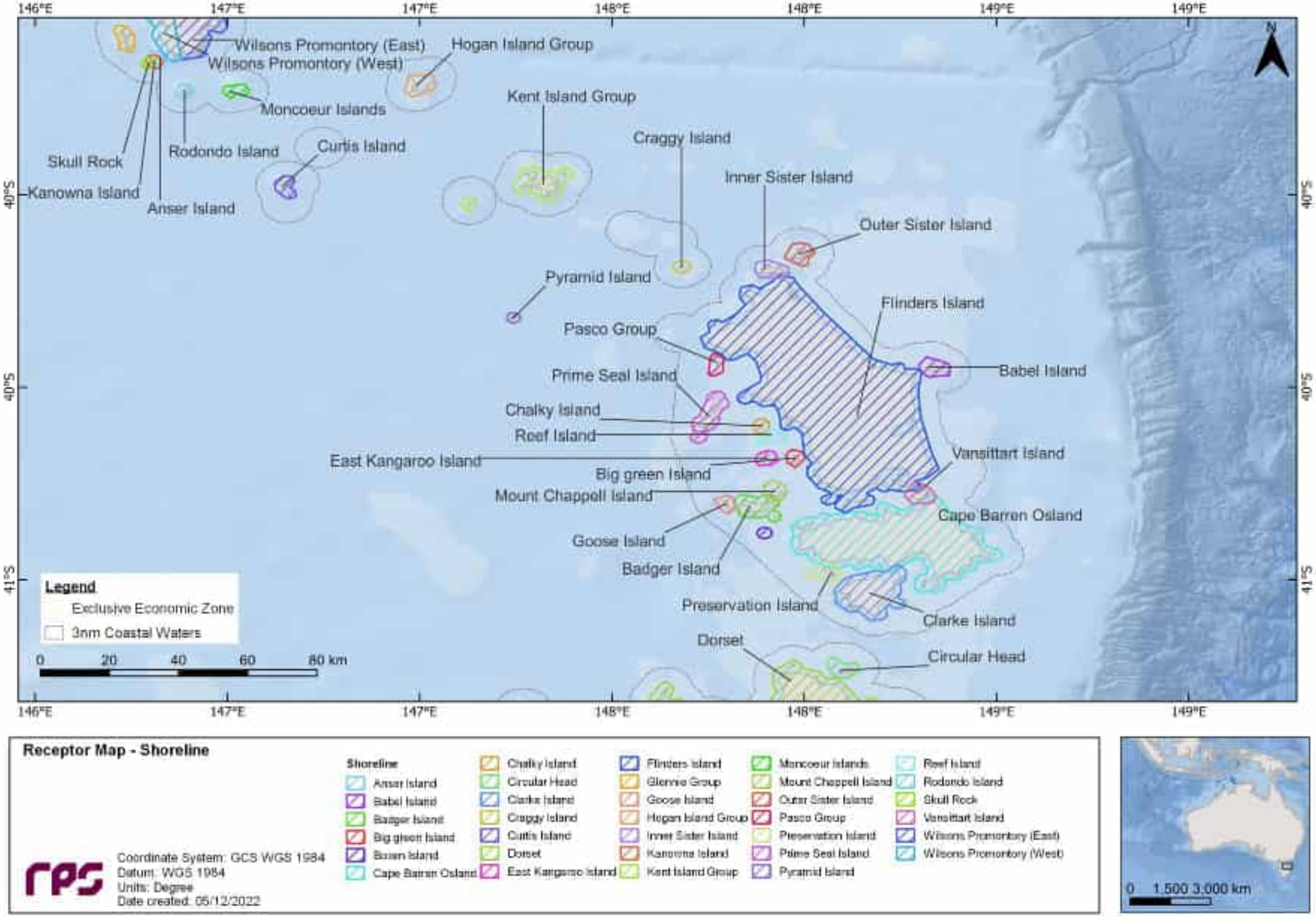


Figure 10.12 Receptor map for shorelines (4 of 5).

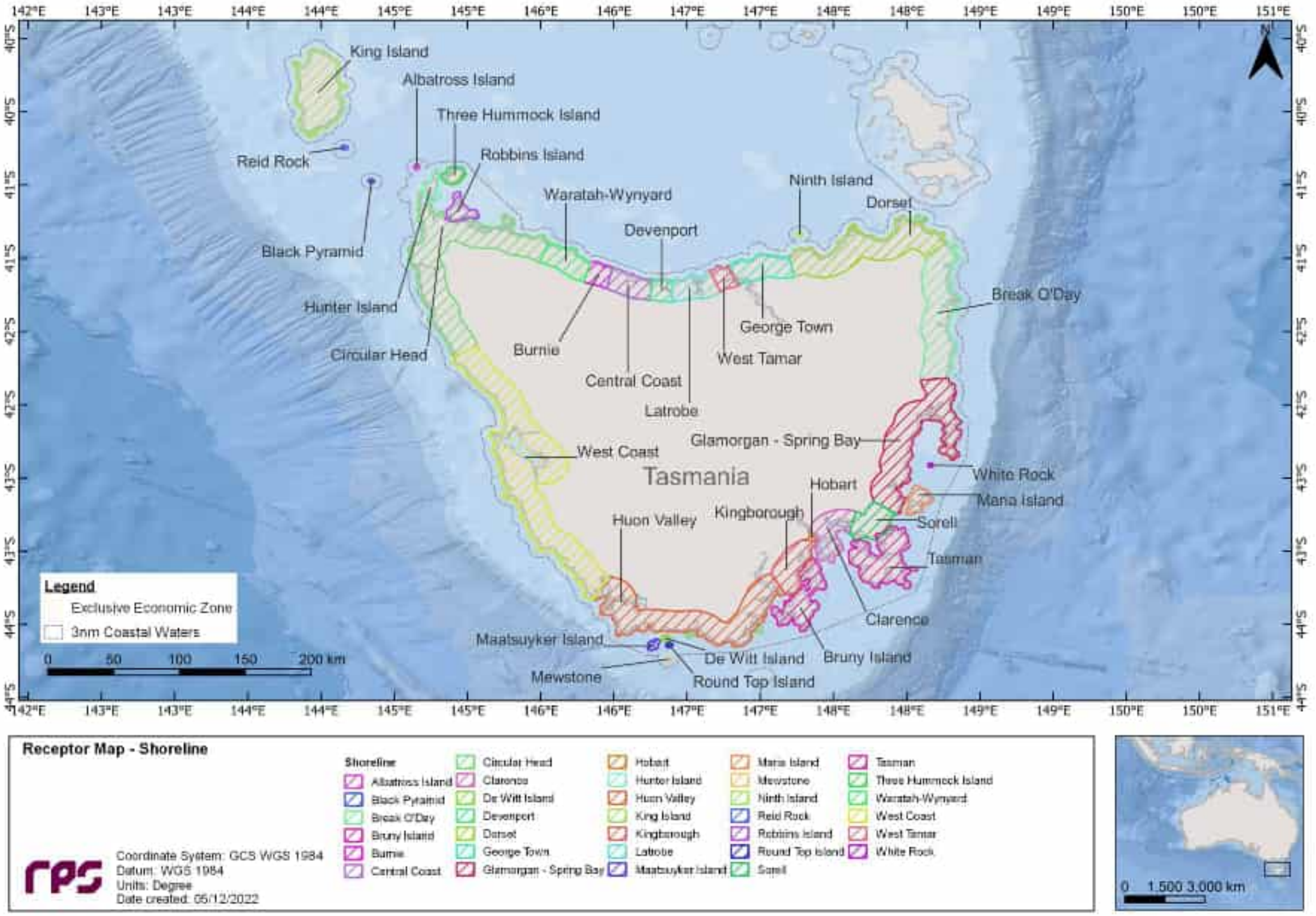


Figure 10.13 Receptor map for shorelines (5 of 5).

11 RESULTS - VESSEL FUEL TANK RUPTURE – 1,066 m^3 SURFACE RELEASE OF MDO

This scenario examined potential exposure following a 1,066 m^3 surface release of MDO over 6 hours from a hypothetical vessel fuel tank rupture. Due to the extent of the EP Area, 100 simulations were modelled at each of the 5 specified release locations and each simulation was tracked for a period of 50 days.

Section 11.1 presents the low threshold EMBA, Section 11.2 shows the stochastic results for predicted floating oil exposure, shoreline accumulation and water column exposure, whereas Section 11.3 presents in the results for the deterministic simulations.

11.1 EMBA

Figure 11.1 shows the full geographic EMBA which encompasses the cumulative extent from all 500 spill simulations using the ‘low’ threshold exposure values for each of the modelled oil components (1 g/m^2 floating, 10 ppb dissolved and entrained, 10 g/m^2 shoreline) and includes all probabilities of exposure. It should be noted that the EMBA does not represent the reach of an individual spill event.

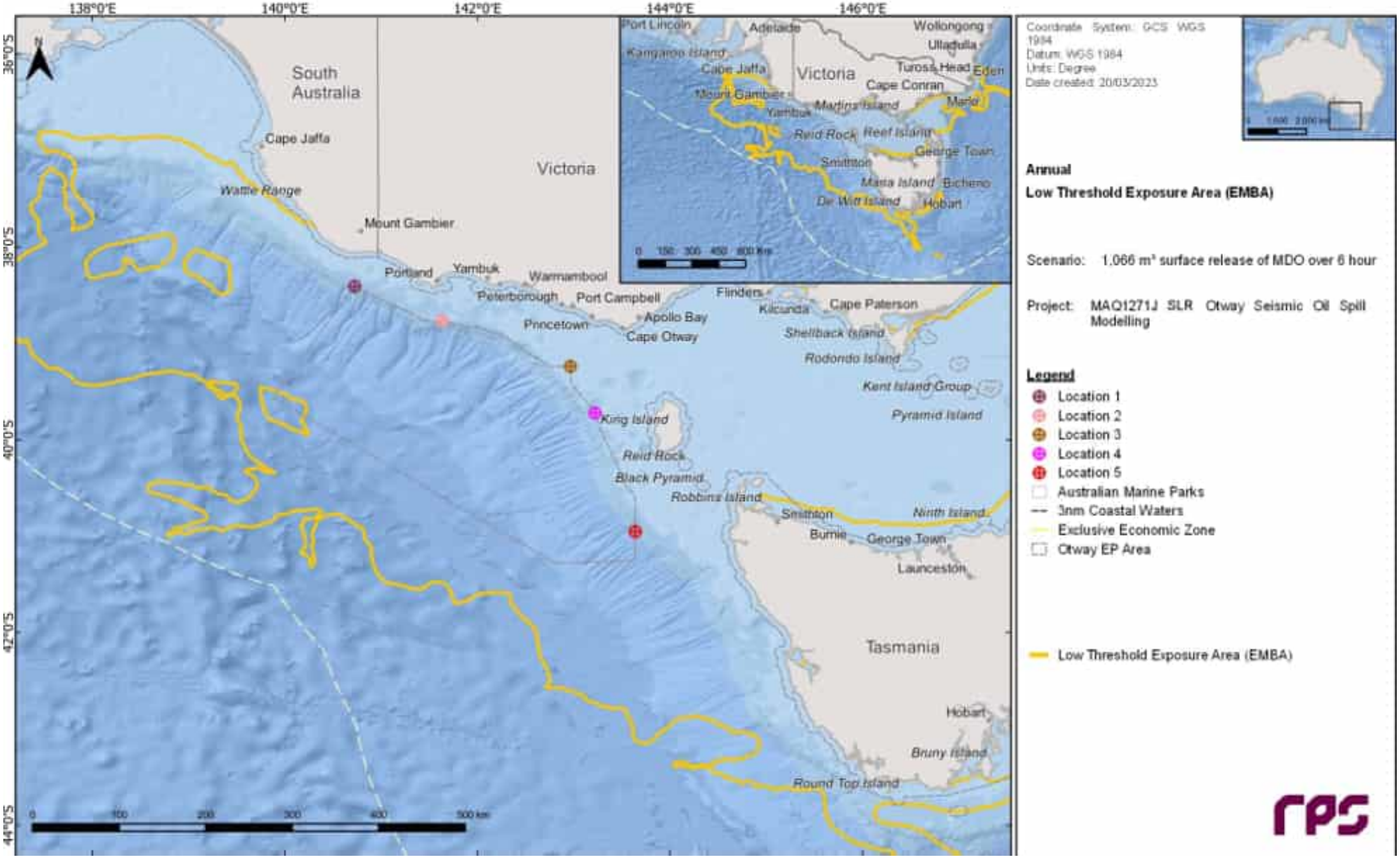


Figure 11.1 Predicted low threshold risk EMBA from an MDO survey vessel tank rupture. The results were derived from 500 spill simulations using the 'low' threshold exposure values for each of the modelled oil components and presented as an annual assessment.

11.2 Stochastic Analysis Results

11.2.1 Floating Oil Exposure

Table 11.1 summarises the maximum zones of floating oil exposure for the five selected release locations modelled. The maximum distance from a release site to low (1-10 g/m^2), moderate (10-50 g/m^2) and high (≥50 g/m^2) exposure levels were 243.2 km east (Release Location 1), 52.5 km east-southeast (Release Location 1) and 22.9 km south-southeast (Release Location 4), respectively.

Table 11.1 summarises the potential floating oil exposure to individual receptors for the five selected release locations modelled. Exposure to AMPs at the low threshold was predicted for Location 3 (Apollo 11%) and Location 4 (Zeehan 65%). Twelve spill simulations (or 12% probability) had crossed into the Victorian state waters from Location 1 at the low threshold. From Location 4, the probability of the spill simulations crossing the Tasmanian and Victorian state waters at the low threshold was 10% and 1%, respectively. The Discovery Bay and Twelve Apostles MPs were exposed by 2 and 1 simulation (2% and 1% probability), respectively from Location 1.

Figure 11.2 illustrate the extent of floating oil exposure receptors based on all 500 spill simulations.

Table 11.1 Maximum distances and directions travelled by floating oil for each exposure threshold from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Release locations	Distance and direction	Zones of potential sea surface exposure		
		Low (1-10 g/m^2)	Moderate (10-50 g/m^2)	High (>50 g/m^2)
1	Maximum distance from release site (km)	243.2	52.5	18.3
	Maximum distance from release site (km) (99th percentile)	176.6	50.1	17.6
	Direction	East	East-southeast	East-southeast
2	Maximum distance from release site (km)	141.5	44.5	21.8
	Maximum distance from release site (km) (99th percentile)	129	39.7	21.3
	Direction	East-southeast	South-southeast	East-southeast
3	Maximum distance from release site (km)	128.6	24.3	16.2
	Maximum distance from release site (km) (99th percentile)	111.2	22.6	15.1
	Direction	East-southeast	Southeast	East
4	Maximum distance from release site (km)	86.7	51.9	22.9
	Maximum distance from release site (km) (99th percentile)	74.2	49.1	19.6
	Direction	South-southeast	East-southeast	South-southeast
5	Maximum distance from release site (km)	140.8	30.0	15.4
	Maximum distance from release site (km) (99th percentile)	92.8	28.5	15.3
	Direction	East-southeast	East-southeast	East-southeast

Table 11.2 Summary of the potential exposure by floating oil to sensitive receptors from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Release locations	Receptor		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (days)		
			Low	Moderate	High	Low	Moderate	High
1	AMP	Apollo	-	-	-	-	-	-
		Nelson	-	-	-	-	-	-
		Zeehan	-	-	-	-	-	-
	IBRA	Bridgewater	3	-	-	2.25	-	-
		Glenelg Plain	1	-	-	4.42	-	-
		King Island	-	-	-	-	-	-
		Otway Plain	1	-	-	6.21	-	-
		Otway Ranges	1	-	-	7.96	-	-
		Tasmanian West	-	-	-	-	-	-
		Warrnambool Plain	1	-	-	12.21	-	-
	IMCRA	Central Bass Strait	-	-	-	-	-	-
		Central Victoria	-	-	-	-	-	-
		Flinders	-	-	-	-	-	-
		Franklin	-	-	-	-	-	-
		Otway	59	9	2	0.13	0.17	0.29
	MP	Discovery Bay	2	-	-	1.63	-	-
		Twelve Apostles	1	-	-	9.83	-	-
	KEF	Bonney Coast Upwelling	15	-	-	1.08	-	-
		West Tasmania Canyons	1	-	-	3.54	-	-
	State waters	South Australia	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-
		Victoria	12	-	-	1.5	-	-
2	AMP	Apollo	-	-	-	-	-	-
		Nelson	-	-	-	-	-	-
		Zeehan	-	-	-	-	-	-
	IBRA	Bridgewater	-	-	-	-	-	-
		Glenelg Plain	-	-	-	-	-	-
		King Island	-	-	-	-	-	-
		Otway Plain	-	-	-	-	-	-
		Otway Ranges	-	-	-	-	-	-
		Tasmanian West	-	-	-	-	-	-
		Warrnambool Plain	-	-	-	-	-	-
	IMCRA	Central Bass Strait	-	-	-	-	-	-
		Central Victoria	-	-	-	-	-	-

Release locations		Receptor	Probability of floating oil exposure (%)			Minimum time before floating oil exposure (days)		
			Low	Moderate	High	Low	Moderate	High
		Flinders	-	-	-	-	-	-
		Franklin	-	-	-	-	-	-
		Otway	100	100	63	0.04	0.04	0.04
	MP	Discovery Bay	-	-	-	-	-	-
		Twelve Apostles	-	-	-	-	-	-
	KEF	Bonney Coast Upwelling	1	-	-	1.71	-	-
		West Tasmania Canyons	-	-	-	-	-	-
	State waters	South Australia	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-
3	AMP	Apollo	11	-	-	2.42	-	-
		Nelson	-	-	-	-	-	-
		Zeehan	-	-	-	-	-	-
	IBRA	Bridgewater	-	-	-	-	-	-
		Glenelg Plain	-	-	-	-	-	-
		King Island	1	-	-	5.58	-	-
		Otway Plain	-	-	-	-	-	-
		Otway Ranges	-	-	-	-	-	-
		Tasmanian West	-	-	-	-	-	-
		Warrnambool Plain	-	-	-	-	-	-
	IMCRA	Central Bass Strait	9	-	-	3.29	-	-
		Central Victoria	1	-	-	3.75	-	-
		Flinders	-	-	-	-	-	-
		Franklin	-	-	-	-	-	-
		Otway	100	100	88	0.04	0.04	0.04
	MP	Discovery Bay	-	-	-	-	-	-
		Twelve Apostles	-	-	-	-	-	-
	KEF	Bonney Coast Upwelling	-	-	-	-	-	-
		West Tasmania Canyons	1	-	-	3.88	-	-
	State waters	South Australia	-	-	-	-	-	-
		Tasmania	1	-	-	5.58	-	-
		Victoria	-	-	-	-	-	-
4	AMP	Apollo	-	-	-	-	-	-
		Nelson	-	-	-	-	-	-
		Zeehan	65	19	9	0.25	0.33	0.5
	IBRA	Bridgewater	-	-	-	-	-	-
		Glenelg Plain	-	-	-	-	-	-

Release locations		Receptor	Probability of floating oil exposure (%)			Minimum time before floating oil exposure (days)		
			Low	Moderate	High	Low	Moderate	High
		King Island	4	-	-	5.29	-	-
		Otway Plain	-	-	-	-	-	-
		Otway Ranges	-	-	-	-	-	-
		Tasmanian West	-	-	-	-	-	-
		Warrnambool Plain	-	-	-	-	-	-
	IMCRA	Central Bass Strait	-	-	-	-	-	-
		Central Victoria	-	-	-	-	-	-
		Flinders	1	-	-	10.63	-	-
		Franklin	-	-	-	-	-	-
		Otway	100	100	70	0.04	0.04	0.04
	MP	Discovery Bay	-	-	-	-	-	-
		Twelve Apostles	-	-	-	-	-	-
	KEF	Bonney Coast Upwelling	-	-	-	-	-	-
		West Tasmania Canyons	12	-	-	0.63	-	-
	State waters	South Australia	-	-	-	-	-	-
		Tasmania	10	-	-	3.38	-	-
		Victoria	1	-	-	10.63	-	-
5	AMP	Apollo	-	-	-	-	-	-
		Nelson	-	-	-	-	-	-
		Zeehan	-	-	-	-	-	-
	IBRA	Bridgewater	-	-	-	-	-	-
		Glenelg Plain	-	-	-	-	-	-
		King Island	1	-	-	11.92	-	-
		Otway Plain	-	-	-	-	-	-
		Otway Ranges	-	-	-	-	-	-
		Tasmanian West	1	-	-	10.83	-	-
		Warrnambool Plain	-	-	-	-	-	-
	IMCRA	Central Bass Strait	-	-	-	-	-	-
		Central Victoria	-	-	-	-	-	-
		Flinders	-	-	-	-	-	-
		Franklin	9	1	-	1.17	1.25	-
		Otway	13	1	-	0.96	1.25	-
	MP	Discovery Bay	-	-	-	-	-	-
		Twelve Apostles	-	-	-	-	-	-
	KEF	Bonney Coast Upwelling	-	-	-	-	-	-
		West Tasmania Canyons	80	41	13	0.04	0.04	0.08
		South Australia	-	-	-	-	-	-

Release locations	Receptor	Probability of floating oil exposure (%)			Minimum time before floating oil exposure (days)		
		Low	Moderate	High	Low	Moderate	High
State waters	Tasmania	2	-	-	10.83	-	-
	Victoria	-	-	-	-	-	-

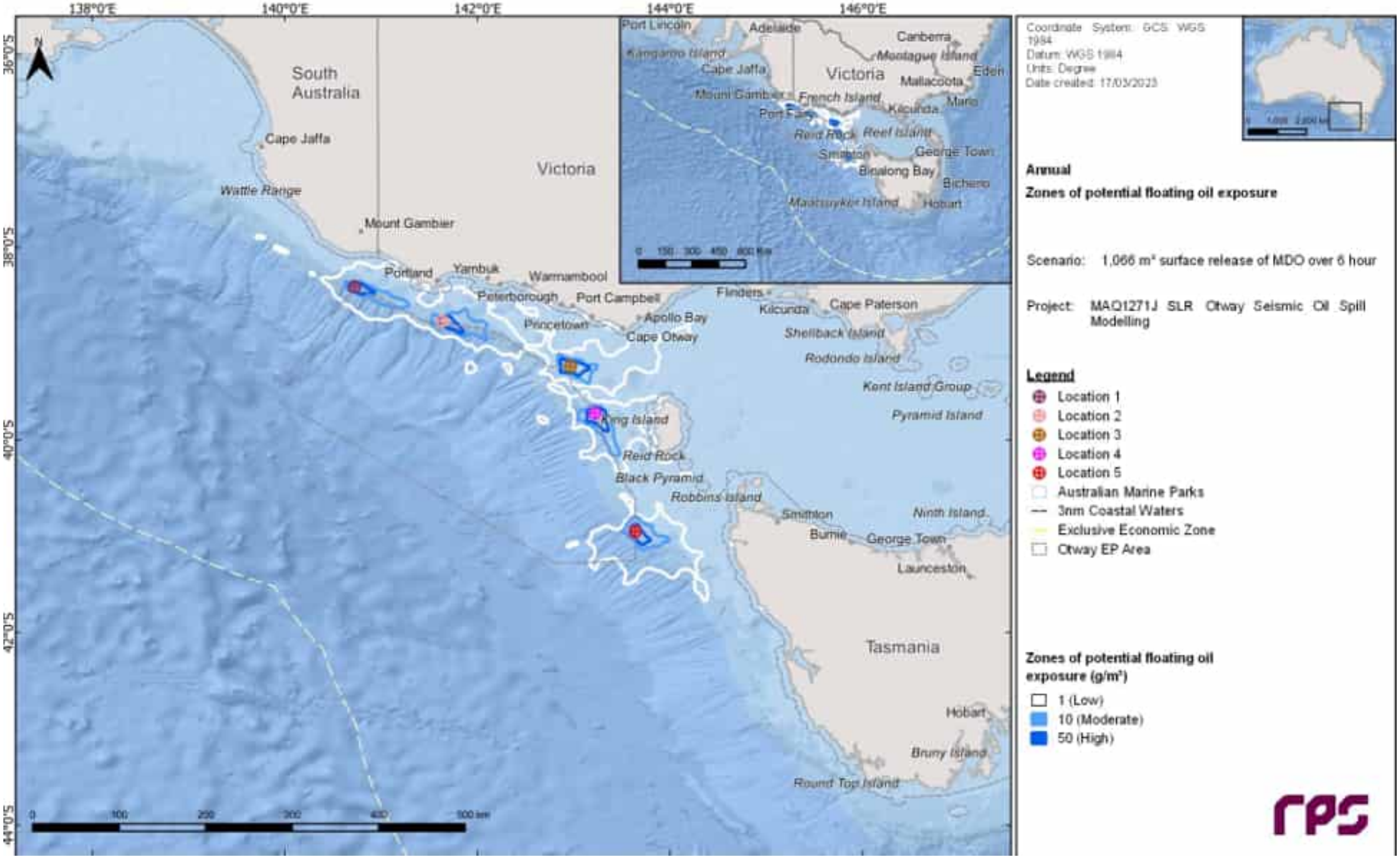


Figure 11.2 Zones of potential floating oil exposure from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.

11.2.2 Shoreline Accumulation

Table 11.3 presents a summary of the predicted shoreline accumulation for the five selected release locations modelled.

The probability of accumulation on any shoreline at, or above, the low threshold (≥ 10 g/m^2) was greatest at Location 5 (65%), while the minimum time before shoreline accumulation was 1.7 days at Location 1. The maximum volume of oil ashore for a single spill above the low threshold was greatest at Location 1 (126.5 m^3) and lowest at Location 2 (28.7 m^3). The maximum lengths of shoreline contacted at the low and moderate thresholds were 65.0 km (Location 5) and 15.0 km (Locations 1 and 4), respectively. Additionally, the maximum lengths of oil accumulation on shorelines at the high threshold (≥1,000 g/m^2) was 2 km recorded at Location 1 and 4.

Table 11.4 summarises the shoreline accumulation to shoreline sectors assessed for the five selected release locations.

The greatest probabilities of oil accumulation to shoreline sectors at the low threshold for a spill occurring from Locations 1, 2, 3, 4 and 5, was recorded at Corangamite (22%), Colac Otway (10%), King Island (9%), King Island (37%) and West Coast (42%) shorelines, respectively. The King Island shoreline also recorded the greatest probabilities of oil accumulation for the moderate and high thresholds from spills occurring at Location 4 (20% and 3%, respectively). Glenelg recorded the quickest time before oil accumulation at the low threshold at 1.67 days from a spill at Location 1. The Glenelg shoreline was also predicted to experience the greatest peak volume ashore of 123.6 m^3 from a spill occurring at Location 1.

Figure 11.3 presents the potential shoreline loading for the specified thresholds from all 500 simulations.

Table 11.3 Summary of oil accumulation on any shoreline from an MDO survey vessel tank rupture for the five selected release locations modelled. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Shoreline Statistics	Location 1	Location 2	Location 3	Location 4	Location 5
Probability of accumulation on any shoreline (%) at or above the low threshold (10 g/m^2)	47	46	51	53	65
Absolute minimum time before oil ashore (days) at or above the low threshold (10 g/m^2)	1.7	6.8	3.5	3.4	3.2
Maximum volume of hydrocarbons ashore (m^3)	126.5	28.7	68.0	66.2	46.5
Average volume of hydrocarbons ashore (m^3)	12.1	2.9	2.9	7.2	3.8
Maximum length of the shoreline at **10 g/m^2** (km)	49.0	42.0	37.0	49.0	65.0
Average shoreline length at **10 g/m^2** (km)	18.5	13.7	11.5	18.5	20.4
Maximum length of the shoreline at **100 g/m^2** (km)	15.0	12.0	11.0	15.0	14.0
Average shoreline length at **100 g/m^2** (km)	7.2	4.7	4.6	6.8	5.0
Maximum length of the shoreline at **1,000 g/m^2** (km)	2.0	-	1.0	2.0	-
Average shoreline length at **1,000 g/m^2** (km)	2.0	-	1.0	1.3	-

Table 11.4 Summary of oil accumulation to shoreline sectors from an MDO survey vessel tank rupture at the five selected release locations. The annualised results were derived from 100 spill simulations per location.

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
1	Albatross Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Anser Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bass Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bega Valley	1	-	-	38.33	-	-	1	16	0.2	0.6	1	-	-	1	-	-
	Black Pyramid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Circular Head	1	-	-	38.5	-	-	< 1	13	< 0.1	0.8	1	-	-	1	-	-
	Colac Otway	14	5	1	5.04	5.42	8.5	11	1,330	4.5	63.5	10.7	5.7	1.9	36.3	7.6	1.9
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	22	11	1	5.08	6.96	11.63	20	1,335	8.1	54.7	12.1	5.8	1.9	31.6	9.6	1.9
	Curtis Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	De Witt Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Gippsland	1	-	-	47.25	-	-	1	15	0.2	0.6	1	-	-	1	-	-
	French Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gabo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	17	9	2	1.67	2.17	3.75	27	5,121	10.2	123.6	12.1	5.6	1.9	22.9	14.3	1.9
	Glennie Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Grant	1	1	-	6.88	8.25	-	2	216	0.9	10.6	18.2	1	-	18.2	1	-
	Greater Geelong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hogan Island Group	1	-	-	15.67	-	-	1	13	< 0.1	0.4	1	-	-	1	-	-
	Hunter Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Huon Valley	1	-	-	38.67	-	-	2	14	0.8	1.4	1.9	-	-	1.9	-	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kent Island Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	3	-	-	14.54	-	-	1	50	0.6	8.1	8.6	-	-	20.1	-	-
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	2	-	-	9.83	-	-	4	20	< 0.1	0.2	1	-	-	1	-	-
	Laurence Rocks	7	-	-	3.96	-	-	7	71	0.3	1.3	2.3	-	-	2.9	-	-
	Maatsuyker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Moncoeur Islands	2	-	-	12.54	-	-	3	86	0.2	2.5	2.9	-	-	3.8	-	-
	Mornington Peninsula	3	-	-	15.79	-	-	1	42	0.4	4.8	5.1	-	-	11.5	-	-
	Moyne	11	4	-	6.17	8.46	-	6	229	2.3	19.7	8.6	4.1	-	21	5.7	-
	Norman Island	2	-	-	36.46	-	-	1	11	< 0.1	0.4	1	-	-	1	-	-
	Pasco Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phillip Island	1	-	-	16.71	-	-	< 1	34	0.2	1.9	1	-	-	1	-	-
	Prime Seal Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reid Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robbins Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Rodondo Island	2	-	-	12.46	-	-	7	81	< 0.1	1	1	-	-	1	-	-
	Seal Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shellback Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Skull Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	South Gippsland	1	-	-	38.71	-	-	1	15	0.2	2.2	2.9	-	-	2.9	-	-
	Surf Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Three Hummock Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Warrnambool	3	1	-	6.29	9.5	-	3	246	0.8	13.3	6.1	3.8	-	14.3	3.8	-
	Wattle Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Yankalilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Albatross Island	1	-	-	16.5	-	-	18	18	< 0.1	< 0.1	1.9	-	-	1.9	-	-
	Anser Island	2	-	-	19.54	-	-	3	33	< 0.1	0.2	1	-	-	1	-	-
	Bass Coast	5	1	-	12.71	14.46	-	3	220	0.1	7.7	9.9	4.8	-	18.2	4.8	-
	Bega Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Black Pyramid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Circular Head	1	-	-	25.17	-	-	< 1	15	< 0.1	< 0.1	1.9	-	-	1.9	-	-
	Colac Otway	10	4	-	6.75	8.67	-	5	278	0.4	12.5	12.8	5.5	-	39.2	11.5	-
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	7	2	-	8.83	11.42	-	4	150	< 0.1	4.4	6.7	1.4	-	11.5	1.9	-
	Curtis Island	1	-	-	12.71	-	-	14	14	< 0.1	< 0.1	1	-	-	1	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	De Witt Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Gippsland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	French Island	1	-	-	35.38	-	-	24	24	0.2	0.2	1	-	-	1	-	-
	Gabo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	5	-	-	8.88	-	-	1	29	< 0.1	0.6	2.7	-	-	7.6	-	-
	Glennie Group	2	1	-	18.13	28.46	-	4	103	< 0.1	2.9	3.8	1	-	6.7	1	-
	Grant	1	-	-	16.54	-	-	15	15	0.1	0.1	1	-	-	1	-	-
	Greater Geelong	1	1	-	10.33	11.71	-	7	851	0.1	13.9	20.1	4.8	-	20.1	4.8	-
	Hogan Island Group	1	-	-	12.58	-	-	2	45	< 0.1	0.1	4.8	-	-	4.8	-	-
	Hunter Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Huon Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	1	-	-	19.21	-	-	3	69	< 0.1	0.7	1.9	-	-	1.9	-	-
	Kent Island Group	2	-	-	15.96	-	-	2	33	< 0.1	0.2	3.3	-	-	4.8	-	-
	King Island	9	1	-	12.08	15.96	-	2	127	< 0.1	3.8	9.1	1	-	26.8	1	-
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	3	-	-	9.67	-	-	6	43	< 0.1	0.2	1	-	-	1	-	-
	Laurence Rocks	1	-	-	10.42	-	-	4	55	< 0.1	0.5	2.9	-	-	2.9	-	-
	Maatsuyker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Moncoeur Islands	2	-	-	20.58	-	-	2	59	< 0.1	0.3	2.4	-	-	3.8	-	-
	Mornington Peninsula	4	-	-	12.17	-	-	1	33	< 0.1	0.6	3.1	-	-	5.7	-	-
	Moyne	8	1	-	9.21	12	-	2	123	< 0.1	3.6	6.2	2.9	-	14.3	2.9	-
	Norman Island	4	1	-	15.63	17.17	-	6	162	< 0.1	3	2.2	1.9	-	4.8	1.9	-
	Pasco Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phillip Island	6	1	-	11	13.25	-	4	232	< 0.1	4.7	5.6	3.8	-	13.4	3.8	-
	Prime Seal Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reid Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robbins Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rodondo Island	1	-	-	17.92	-	-	14	14	< 0.1	< 0.1	1	-	-	1	-	-
	Seal Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shellback Island	5	1	-	15.5	16.04	-	22	294	< 0.1	2.8	1	1	-	1	1	-
	Skull Rock	1	-	-	19.21	-	-	69	69	0.7	0.7	1.9	-	-	1.9	-	-
	South Gippsland	10	2	-	13.63	16	-	2	237	0.2	6.4	7.6	1.9	-	18.2	2.9	-
	Surf Coast	2	-	-	10.29	-	-	2	86	< 0.1	0.7	6.7	-	-	11.5	-	-
	Three Hummock Island	1	-	-	18.42	-	-	14	14	< 0.1	< 0.1	1	-	-	1	-	-
	Warrnambool	5	-	-	10.46	-	-	4	46	< 0.1	1.2	4.6	-	-	10.5	-	-
	Wattle Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Yankalilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Albatross Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Anser Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bass Coast	2	-	-	26.38	-	-	1	22	< 0.1	0.7	5.7	-	-	6.7	-	-
	Bega Valley	1	-	-	12.13	-	-	87	87	0.5	0.5	4.8	-	-	4.8	-	-
	Black Pyramid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Circular Head	2	-	-	23.42	-	-	< 1	20	< 0.1	0.4	2.9	-	-	3.8	-	-
	Colac Otway	7	1	-	5.92	15.13	-	3	134	< 0.1	3.7	8.5	1	-	19.1	1	-
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	3	1	-	5.5	6.63	-	6	268	0.1	10.2	13.4	8.6	-	25.8	8.6	-
	Curtis Island	1	-	-	11.08	-	-	15	15	0.1	0.1	2.9	-	-	2.9	-	-
	De Witt Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Gippsland	2	-	-	39.63	-	-	1	78	< 0.1	1.5	3.3	-	-	3.8	-	-
	French Island	2	-	-	26.42	-	-	< 1	25	< 0.1	0.3	1.4	-	-	1.9	-	-
	Gabo Island	2	-	-	12.54	-	-	7	35	< 0.1	0.3	1.4	-	-	1.9	-	-
	Glenelg	1	-	-	24.5	-	-	40	40	0.9	0.9	7.6	-	-	7.6	-	-
	Glennie Group	2	-	-	21.79	-	-	2	14	< 0.1	0.3	2.9	-	-	3.8	-	-
	Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Greater Geelong	4	1	-	18.63	30.5	-	3	106	0.2	7.9	16	1	-	24.9	1	-
	Hogan Island Group	3	-	-	11.75	-	-	2	57	< 0.1	0.3	2.5	-	-	5.7	-	-
	Hunter Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Huon Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	1	-	-	36.92	-	-	11	11	0.1	0.1	1	-	-	1	-	-
	Kent Island Group	2	-	-	26.54	-	-	1	18	< 0.1	0.3	1.9	-	-	2.9	-	-
	King Island	9	3	1	3.46	5.17	6.25	6	1,306	0.7	53.1	15	4.8	1	31.6	10.5	1
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Laurence Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maatsuyker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Moncoeur Islands	1	-	-	23.96	-	-	46	46	0.5	0.5	3.8	-	-	3.8	-	-
	Mornington Peninsula	6	-	-	24.25	-	-	2	32	< 0.1	2	5.6	-	-	12.4	-	-
	Moyne	1	-	-	13.46	-	-	21	21	0.8	0.8	13.4	-	-	13.4	-	-
	Norman Island	6	-	-	21.96	-	-	3	23	< 0.1	0.4	1.4	-	-	2.9	-	-
	Pasco Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phillip Island	3	-	-	26.29	-	-	1	24	< 0.1	0.2	1.3	-	-	1.9	-	-
	Prime Seal Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reid Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robbins Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Rodondo Island	1	-	-	25.29	-	-	13	13	< 0.1	< 0.1	1	-	-	1	-	-
	Seal Islands	1	-	-	23.83	-	-	24	24	0.6	0.6	4.8	-	-	4.8	-	-
	Shellback Island	4	-	-	22.67	-	-	9	64	< 0.1	0.5	1	-	-	1	-	-
	Skull Rock	1	-	-	36.92	-	-	11	11	0.1	0.1	1	-	-	1	-	-
	South Gippsland	8	1	-	11.42	26.42	-	2	225	0.2	10.1	6.5	5.7	-	13.4	5.7	-
	Surf Coast	5	-	-	9.79	-	-	3	49	< 0.1	4.8	10.1	-	-	21	-	-
	Three Hummock Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Warrnambool	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wattle Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	West Coast	2	-	-	20.33	-	-	1	33	< 0.1	1.5	11.5	-	-	16.3	-	-
	Yankalilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Albatross Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Anser Island	2	2	-	10.42	11.17	-	21	214	< 0.1	1.7	1.4	1	-	1.9	1	-
	Bass Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bega Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Black Pyramid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Circular Head	2	-	-	15.13	-	-	< 1	43	< 0.1	0.7	7.2	-	-	11.5	-	-
	Colac Otway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Curtis Island	2	-	-	18.46	-	-	2	29	< 0.1	< 0.1	1.4	-	-	1.9	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	De Witt Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Gippsland	1	-	-	41	-	-	13	13	< 0.1	< 0.1	1	-	-	1	-	-
	French Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gabo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glennie Group	2	-	-	13.5	-	-	6	63	< 0.1	0.8	5.3	-	-	6.7	-	-
	Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Greater Geelong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hogan Island Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hunter Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Huon Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	4	1	-	10.04	11.17	-	20	214	< 0.1	3.1	2.2	2.9	-	3.8	2.9	-
	Kent Island Group	3	-	-	20.58	-	-	1	18	< 0.1	< 0.1	1	-	-	1	-	-
	King Island	37	20	3	3.38	3.96	5.63	16	1,684	3.6	44.8	21.9	6.7	1.3	46.8	14.3	1.9
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Laurence Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maatsuyker	1	-	-	37.92	-	-	13	13	< 0.1	< 0.1	1	-	-	1	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Moncoeur Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mornington Peninsula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Moyne	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Norman Island	3	1	-	12.42	13.5	-	30	394	< 0.1	6.4	3.2	1.9	-	4.8	1.9	-
	Pasco Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phillip Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Prime Seal Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Reid Rock	5	-	-	5.67	-	-	4	35	< 0.1	0.3	2.1	-	-	2.9	-	-
	Robbins Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Robe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rodondo Island	1	-	-	12.88	-	-	27	27	< 0.1	< 0.1	1	-	-	1	-	-
	Seal Islands	1	-	-	17.71	-	-	32	32	0.5	0.5	7.6	-	-	7.6	-	-
	Shellback Island	3	-	-	13.88	-	-	15	46	< 0.1	0.2	1	-	-	1	-	-
	Skull Rock	4	1	-	10.04	11.25	-	17	162	< 0.1	1.6	1.9	1.9	-	2.9	1.9	-
	South Gippsland	5	2	-	11.17	11.67	-	5	128	< 0.1	4.3	8.6	1.4	-	17.2	1.9	-
	Surf Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Three Hummock Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Warrnambool	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wattle Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	West Coast	4	-	-	28.08	-	-	< 1	17	< 0.1	0.2	1.9	-	-	2.9	-	-
	Yankalilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Albatross Island	1	-	-	3.21	-	-	32	32	< 0.1	< 0.1	2.9	-	-	2.9	-	-
	Anser Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bass Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bega Valley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Black Pyramid	4	-	-	6.67	-	-	13	94	< 0.1	0.3	1	-	-	1	-	-
	Circular Head	35	9	-	4.75	6.08	-	5	420	1	19.2	16.4	4.8	-	57.4	12.4	-
	Colac Otway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Curtis Island	1	-	-	32.71	-	-	19	19	0.2	0.2	1.9	-	-	1.9	-	-
5	De Witt Island	2	-	-	16.21	-	-	2	38	< 0.1	0.2	1.9	-	-	1.9	-	-
	East Gippsland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	French Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gabo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glennie Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Greater Geelong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hogan Island Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hunter Island	11	6	-	4.33	6.17	-	7	337	0.3	12.1	15.1	3.7	-	25.8	7.6	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Huon Valley	7	-	-	18.92	-	-	1	78	< 0.1	2.3	4.5	-	-	7.6	-	-
	Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kanowna Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kent Island Group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	1	-	-	33.29	-	-	16	16	0.8	0.8	5.7	-	-	5.7	-	-
	Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lady Julia Percy Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Laurence Rocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maatsuyker	1	-	-	14.75	-	-	14	14	< 0.1	< 0.1	1.9	-	-	1.9	-	-
	Moncoeur Islands	1	-	-	32.29	-	-	11	11	< 0.1	< 0.1	1	-	-	1	-	-
	Mornington Peninsula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Moyne	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Norman Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pasco Group	1	-	-	19.29	-	-	11	11	< 0.1	< 0.1	1	-	-	1	-	-
	Phillip Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Prime Seal Island	1	-	-	25.83	-	-	12	12	< 0.1	< 0.1	1	-	-	1	-	-
	Reid Rock	2	-	-	3.88	-	-	11	98	< 0.1	0.2	2.9	-	-	2.9	-	-
	Robbins Island	1	-	-	12.79	-	-	11	11	< 0.1	< 0.1	1	-	-	1	-	-
	Robe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site	Shoreline Receptor	Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m²)		Volume on shoreline (m³)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
		Low	Moderate	High	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
	Rodondo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Seal Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shellback Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Skull Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	South Gippsland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Surf Coast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Three Hummock Island	2	-	-	12.04	-	-	2	42	< 0.1	< 0.1	1.4	-	-	1.9	-	-
	Warrnambool	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wattle Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	West Coast	42	10	-	5.29	9.5	-	4	359	1.2	19.1	11.5	3.6	-	40.2	10.5	-
	Yankalilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 11.5 Summary of oil accumulation to individual shoreline sectors from an MDO survey vessel tank rupture derived from all 500 simulations during annualised conditions.

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Albatross Island	3.21	-	-	32	32	< 0.1	< 0.1	1.9	-	-	2.9	-	-
Anser Island	10.42	11.17	-	5	214	< 0.1	1.7	1.2	1	-	1.9	1	-
Bass Coast	12.71	14.46	-	2	220	< 0.1	7.7	7.9	4.8	-	18.2	4.8	-
Bega Valley	12.13	-	-	1	87	< 0.1	0.5	4.8	-	-	4.8	-	-
Black Pyramid	6.67	-	-	5	94	< 0.1	0.3	1	-	-	1	-	-
Circular Head	4.75	6.08	-	3	420	0.2	19.2	14.7	5.3	-	57.4	12.4	-
Colac Otway	5.92	8.67	-	2	278	< 0.1	12.5	10.4	4.6	-	39.2	11.5	-
Coorong	30.96	-	-	< 1	14	< 0.1	0.4	3.8	-	-	3.8	-	-
Corangamite	5.5	6.63	-	3	268	< 0.1	10.2	9.4	3.8	-	29.6	8.6	-
Curtis Island	11.08	-	-	2	29	< 0.1	0.2	1.7	-	-	2.9	-	-
De Witt Island	16.21	-	-	2	38	< 0.1	0.2	1.9	-	-	1.9	-	-
East Gippsland	39.63	-	-	< 1	78	< 0.1	1.5	2.5	-	-	3.8	-	-
French Island	26.42	-	-	< 1	25	< 0.1	0.3	1.3	-	-	1.9	-	-
Gabo Island	12.54	-	-	3	35	< 0.1	0.3	1.4	-	-	1.9	-	-
Glenelg	6.5	6.83	11.17	6	1,487	0.3	44.2	9.8	6.3	1	33.5	12.4	1
Glennie Group	13.5	28.46	-	3	103	< 0.1	2.9	4	1	-	6.7	1	-
Grant	3.42	4.04	8.21	7	1,749	0.4	51.2	13.2	7	1.9	36.3	13.4	1.9
Greater Geelong	10.33	11.71	-	3	851	< 0.1	13.9	16.8	2.9	-	24.9	4.8	-
Hogan Island Group	11.75	-	-	2	57	< 0.1	0.3	3.1	-	-	5.7	-	-
Hunter Island	4.33	6.17	-	3	337	< 0.1	12.1	12.6	3.7	-	25.8	7.6	-
Huon Valley	18.92	-	-	1	78	< 0.1	2.3	4.1	-	-	7.6	-	-

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Kangaroo Island	49.67	-	-	< 1	10	< 0.1	0.2	1.9	-	-	1.9	-	-
Kanowna Island	10.04	11.17	-	4	214	< 0.1	3.1	1.9	2.9	-	3.8	2.9	-
Kent Island Group	15.96	-	-	1	33	< 0.1	0.3	1.8	-	-	4.8	-	-
King Island	3.38	3.96	5.63	7	1,684	0.7	53.1	16.2	6	1.2	46.8	14.3	1.9
Kingston	23.5	-	-	1	45	< 0.1	2.1	12.4	-	-	12.4	-	-
Lady Julia Percy Island	9.67	-	-	3	43	< 0.1	0.2	1	-	-	1	-	-
Laurence Rocks	10.42	-	-	2	55	< 0.1	0.5	1.9	-	-	2.9	-	-
Maatsuyker	14.75	-	-	1	14	< 0.1	< 0.1	1.4	-	-	1.9	-	-
Moncoeur Islands	20.58	-	-	2	59	< 0.1	0.5	2.4	-	-	3.8	-	-
Mornington Peninsula	12.17	-	-	1	33	< 0.1	2	4.6	-	-	12.4	-	-
Moyne	8.75	12	-	2	123	< 0.1	3.6	6.4	2.9	-	14.3	2.9	-
Norman Island	12.42	13.5	-	6	394	< 0.1	6.4	2.1	1.9	-	4.8	1.9	-
Pasco Group	19.29	-	-	< 1	11	< 0.1	< 0.1	1	-	-	1	-	-
Phillip Island	11	13.25	-	2	232	< 0.1	4.7	4.1	3.8	-	13.4	3.8	-
Prime Seal Island	25.83	-	-	1	12	< 0.1	< 0.1	1	-	-	1	-	-
Reid Rock	3.88	-	-	3	98	< 0.1	0.3	2.3	-	-	2.9	-	-
Robbins Island	12.79	-	-	< 1	11	< 0.1	< 0.1	1	-	-	1	-	-
Robe	5.58	6.08	-	5	457	< 0.1	11.4	7.2	4.5	-	18.2	5.7	-
Rodondo Island	12.88	-	-	3	27	< 0.1	< 0.1	1	-	-	1	-	-
Seal Islands	17.71	-	-	2	32	< 0.1	0.6	6.2	-	-	7.6	-	-
Shellback Island	13.88	16.04	-	12	294	< 0.1	2.8	1	1	-	1	1	-
Skull Rock	10.04	11.25	-	4	162	< 0.1	1.6	1.8	1.9	-	2.9	1.9	-
South Gippsland	11.17	11.67	-	2	237	< 0.1	10.1	7	2.5	-	18.2	5.7	-

Shoreline Receptor	Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline contacted (km)			Maximum length of shoreline contacted (km)		
	Low	Moderate	High	Mean	Peak	Mean	Peak	Low	Moderate	High	Low	Moderate	High
Surf Coast	9.79	-	-	2	86	< 0.1	4.8	8.2	-	-	21	-	-
Three Hummock Island	12.04	-	-	1	42	< 0.1	< 0.1	1.3	-	-	1.9	-	-
Warrnambool	10.46	-	-	2	46	< 0.1	1.2	4.8	-	-	10.5	-	-
Wattle Range	5.54	5.83	-	5	416	< 0.1	16	12.7	4.8	-	32.5	11.5	-
West Coast	5.29	9.5	-	2	359	0.2	19.1	10.3	3.6	-	40.2	10.5	-
Yankalilla	46.42	-	-	1	10	< 0.1	0.1	1	-	-	1	-	-

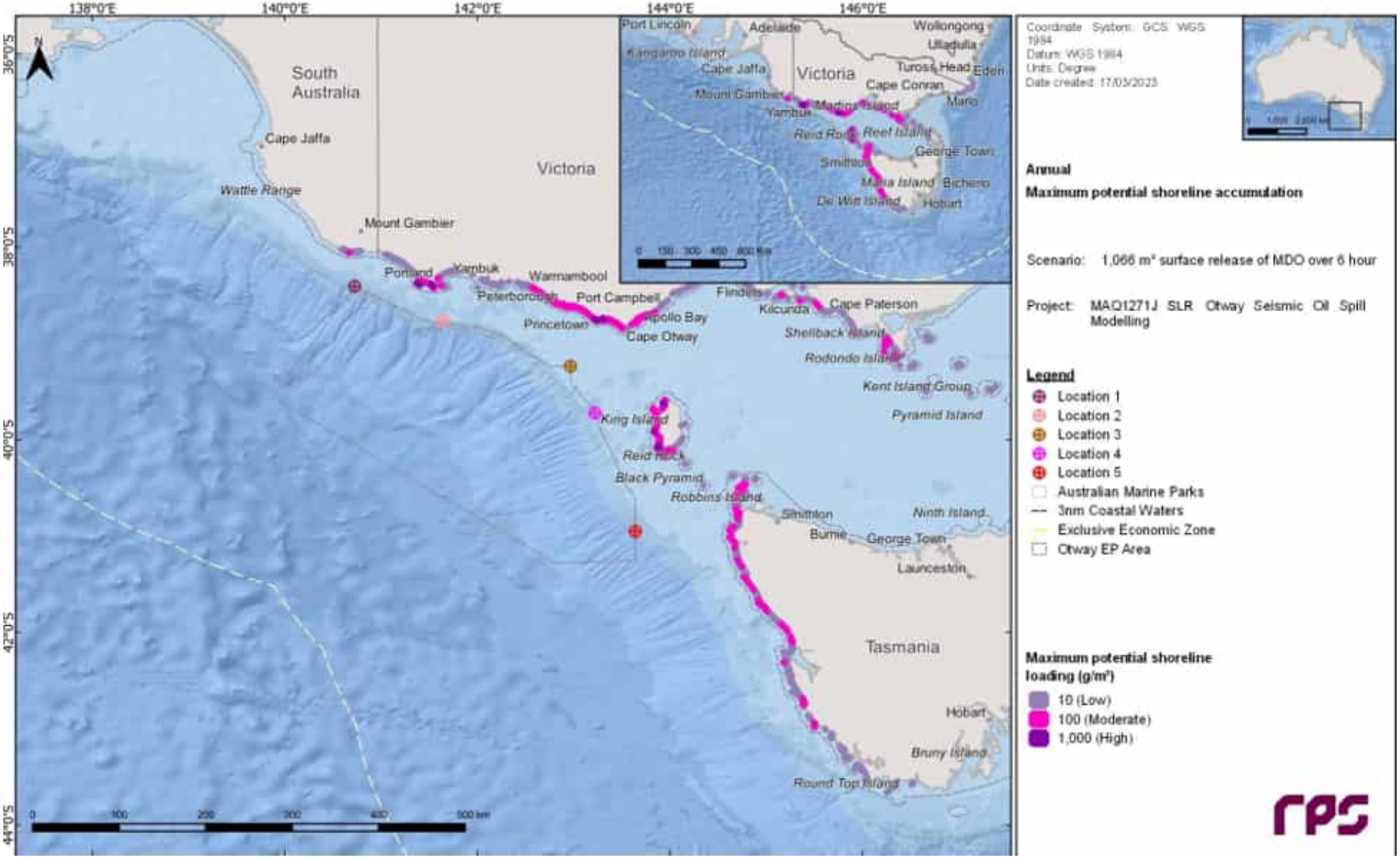


Figure 11.3 Maximum potential shoreline accumulation from an MDO survey vessel tank rupture derived. The results were derived from 100 spill simulations per location and presented as an annual assessment.

11.2.3 Water Column Exposure

11.2.3.1 Dissolved Hydrocarbons

Table 11.6 summarise the maximum dissolved hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0-10 m depth layer from an MDO survey vessel tank rupture at the five selected release locations.

Exposure to AMPs at the low threshold (≥10 ppb) was recorded at Apollo (4% Location 2, 9% Location 3 and 2% Location 4%), Boags (1% Location 5), Franklin (5% Location 5) and Zeehan (1% Location 2 and 3; and 29% Location 4).

The greatest maximum instantaneous concentrations (ppb) in the 0-10 m depth layer was predicted to occur within the Otway IMCRA at Location 2 (358 ppb).

Figure 11.4 to Figure 11.6 illustrate the extent of the dissolved hydrocarbon exposure in the 0-10 m, 10-20 m and 20-30 m depth layers, based on all 500 spill simulations, respectively.

Table 11.6 Maximum dissolved hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0-10 m depth layer from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Receptor		Release Location 1				Release Location 2				Release Location 3				Release Location 4				Release Location 5			
		Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)		
			Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High
AMP	Apollo	-	-	-	-	33	4	-	-	112	9	1	-	37	2	-	-	-	-	-	-
	Boags	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	23	1	-	-
	Franklin	-	-	-	-	2	-	-	-	1	-	-	-	5	-	-	-	87	5	1	-
	Murray	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nelson	-	-	-	-	5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Zeehan	-	-	-	-	17	1	-	-	17	1	-	-	153	29	6	-	6	-	-	-
IBRA	Bridgewater	20	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg Plain	24	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	-	-	-	-	1	-	-	-	35	1	-	-	30	3	-	-	29	2	-	-
	Otway Ranges	13	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Warrnambool Plain	18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IMCRA	Boags	-	-	-	-	-	-	-	-	-	0	-	-	3	-	-	-	23	1	-	-
	Central Bass Strait	-	-	-	-	23	2	-	-	52	5	1	-	39	2	-	-	51	2	1	-
	Central Victoria	-	-	-	-	22	2	-	-	29	3	-	-	3	-	-	-	-	-	-	-
	Coorong	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Franklin	-	-	-	-	3	-	-	-	2	-	-	-	3	-	-	-	111	11	2	-
	Otway	108	23	10	-	358	66	32	-	318	79	42	-	352	73	49	-	107	10	3	-
KEF	Bonney Coast Upwelling	83	8	1	-	45	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
	West Tasmania Canyons	15	1	-	-	29	2	-	-	75	3	1	-	86	6	2	-	164	46	19	-

Receptor		Release Location 1				Release Location 2				Release Location 3				Release Location 4				Release Location 5			
		Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)			Max conc (ppb)	Probability (%)		
			Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High		Low	Mod	High
MNP	Discovery Bay	18.7	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Twelve Apostles	20.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramsar	Glenelg Estuary and Discovery Bay Wetlands	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RSB	Bravenes Rock	12.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
State Waters	South Australia	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tasmania	-	-	-	-	2	-	-	-	35	3	-	-	41	6	-	-	38	3	-	-
	Victoria	44	4	-	-	15	1	-	-	8	-	-	-	1	-	-	-	-	-	-	-
Near shore waters	Black Pyramid	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	19	2	-	-
	Circular Head	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	29	2	-	-
	Corangamite	18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Glenelg	24	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	King Island	-	-	-	-	1	-	-	-	35	1	-	-	28	4	-	-	-	-	-	-

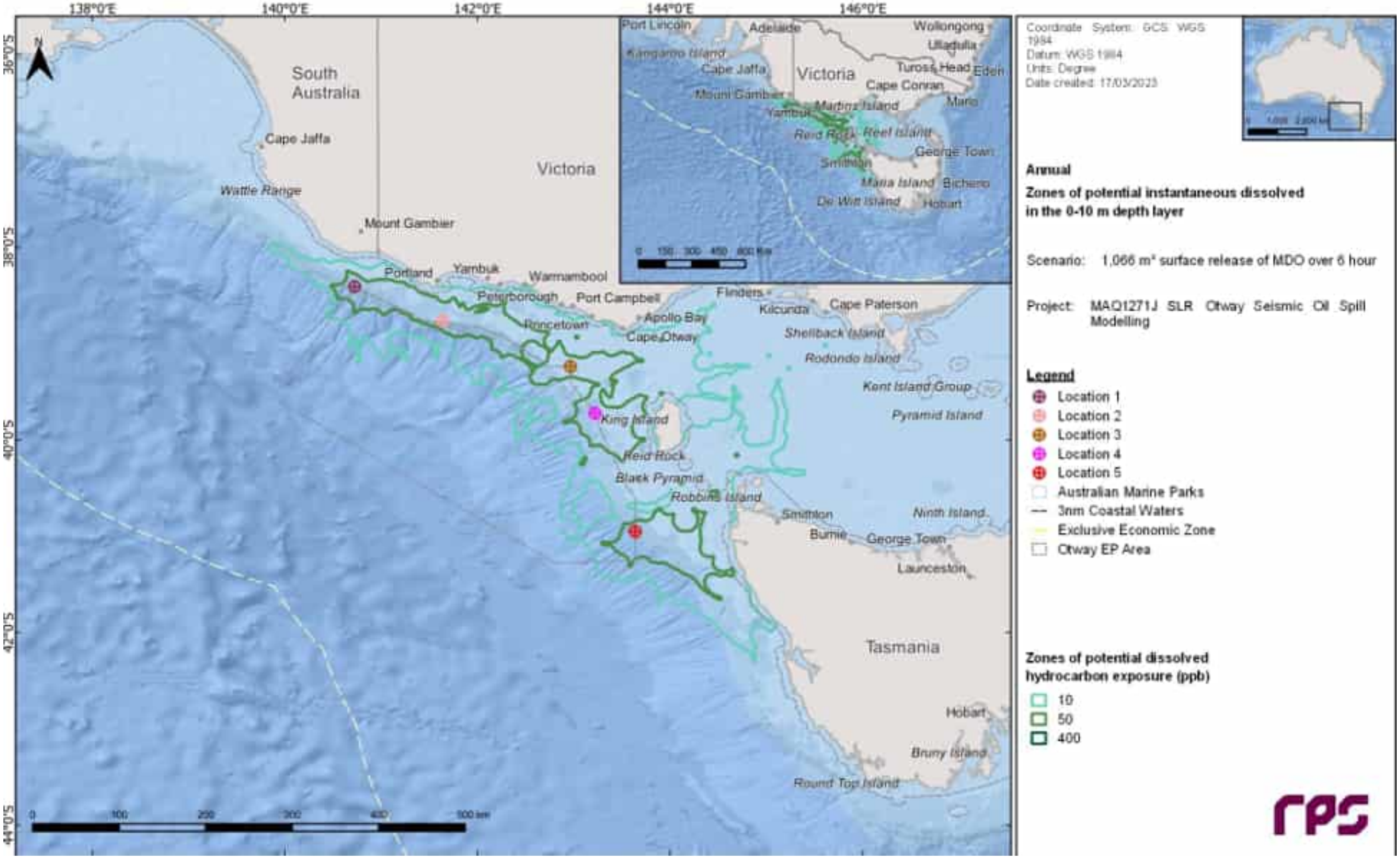


Figure 11.4 Zones of potential dissolved hydrocarbon exposure in the 0-10 m depth layer from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.

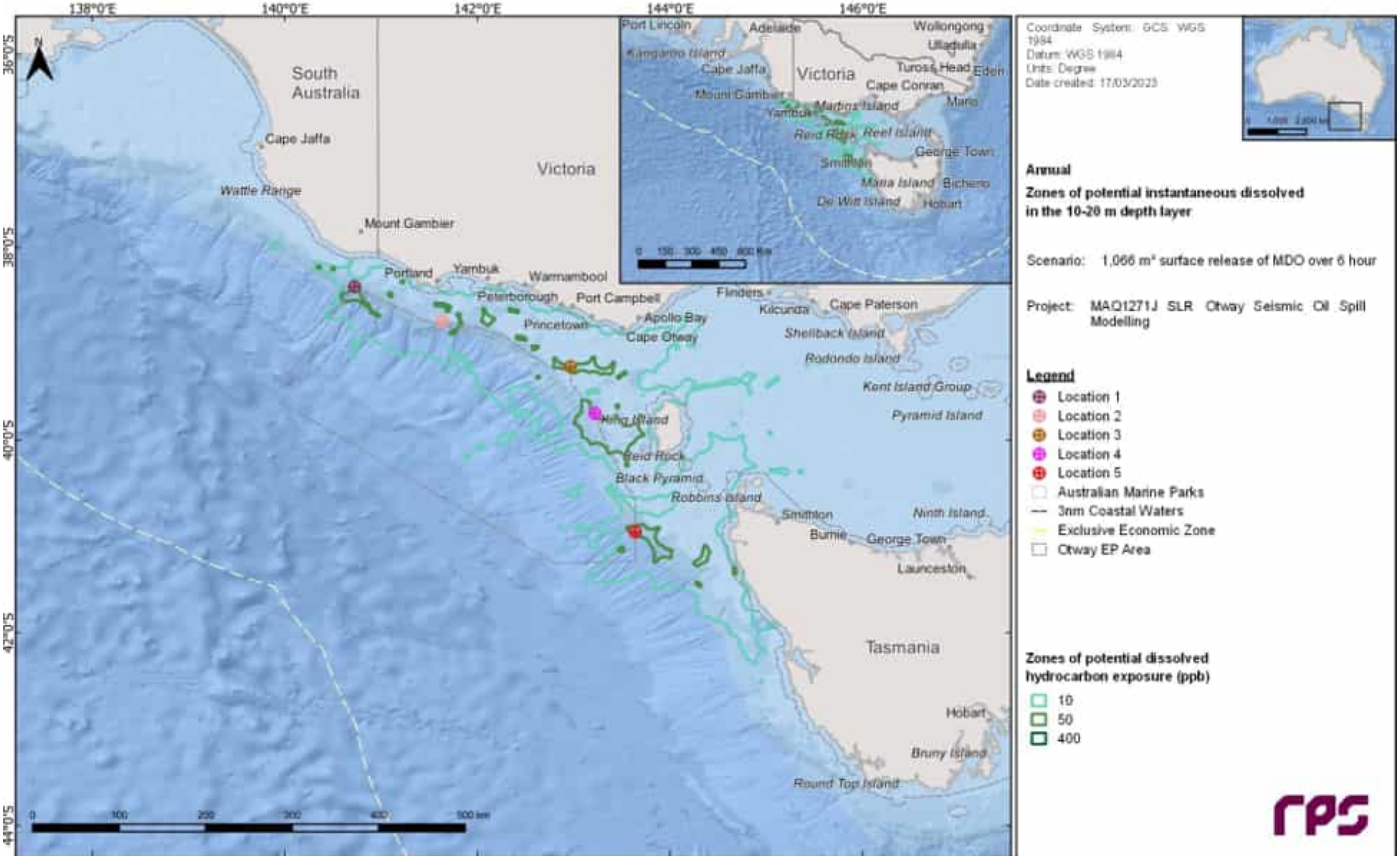


Figure 11.5 **Zones of potential dissolved hydrocarbon exposure in the 10-20 m depth layer from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.**

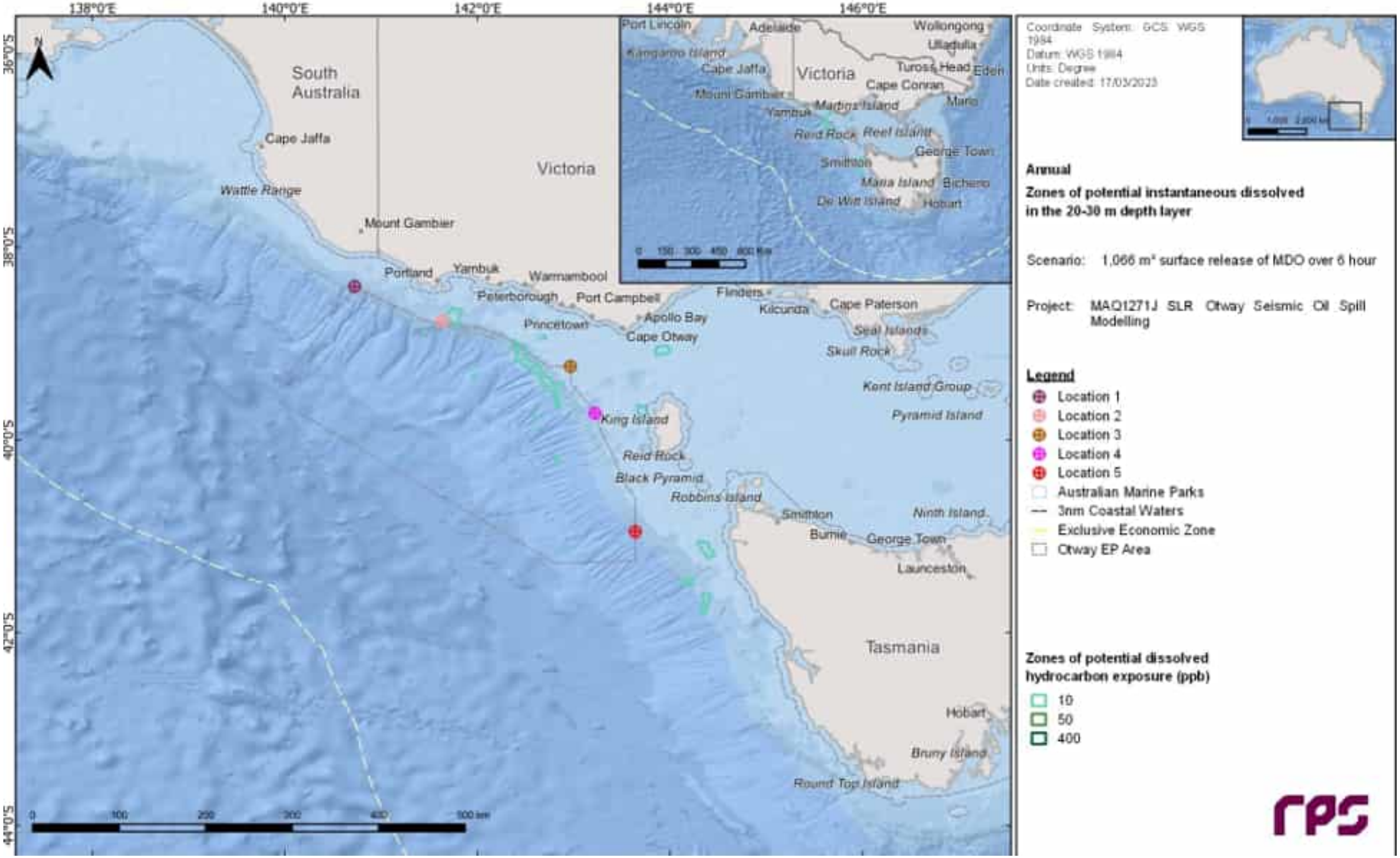


Figure 11.6 Zones of potential dissolved hydrocarbon exposure in the 20-30 m depth layer from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.

11.2.3.2 Entrained Hydrocarbons

Table 11.7 and Table 11.8 summarises the maximum entrained hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0-10 m and 10-20 m depth layers, respectively, from an MDO survey vessel tank rupture at the five selected release locations.

Across all five selected locations, a total of 10 AMPs were predicted to be exposed at the low threshold (≥ 10 ppb), with probabilities up to 40%. Apollo AMP was predicted to record the highest probabilities of exposure at 40% and 39% from spills originating from Location 3 and Location 1, respectively. Additionally, the Apollo AMP recorded the greatest probability of exposure at the high threshold (≥ 100 ppb) at 25% from spills originating from Location 3.

The maximum entrained hydrocarbon concentration was 30,878 ppb recorded for the Otway IMCRA from a spill originating at Location 3.

Table 11.8 Maximum entrained hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 10-20 m depth layer from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Locatio	
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low
AMP	Apollo	-	-	-	6	-	-	18	2	-	5	-
	Nelson	-	-	-	3	-	-	1	-	-	1	-
	Zeehan	-	-	-	6	-	-	4	-	-	15	3
IMCRA	Coorong	-	-	-	1	-	-	-	-	-	-	-
	Franklin	-	-	-	2	-	-	2	-	-	2	-
	Otway	18	1	-	18	3	-	18	4	-	20	3
KEF	Bonney Coast Upwelling	15	1	-	8	-	-	3	-	-	-	-
	West Tasmania Canyons	-	-	-	11	1	-	8	-	-	12	1
State Waters	Tasmania	-	-	-	2	-	-	7	-	-	10	1

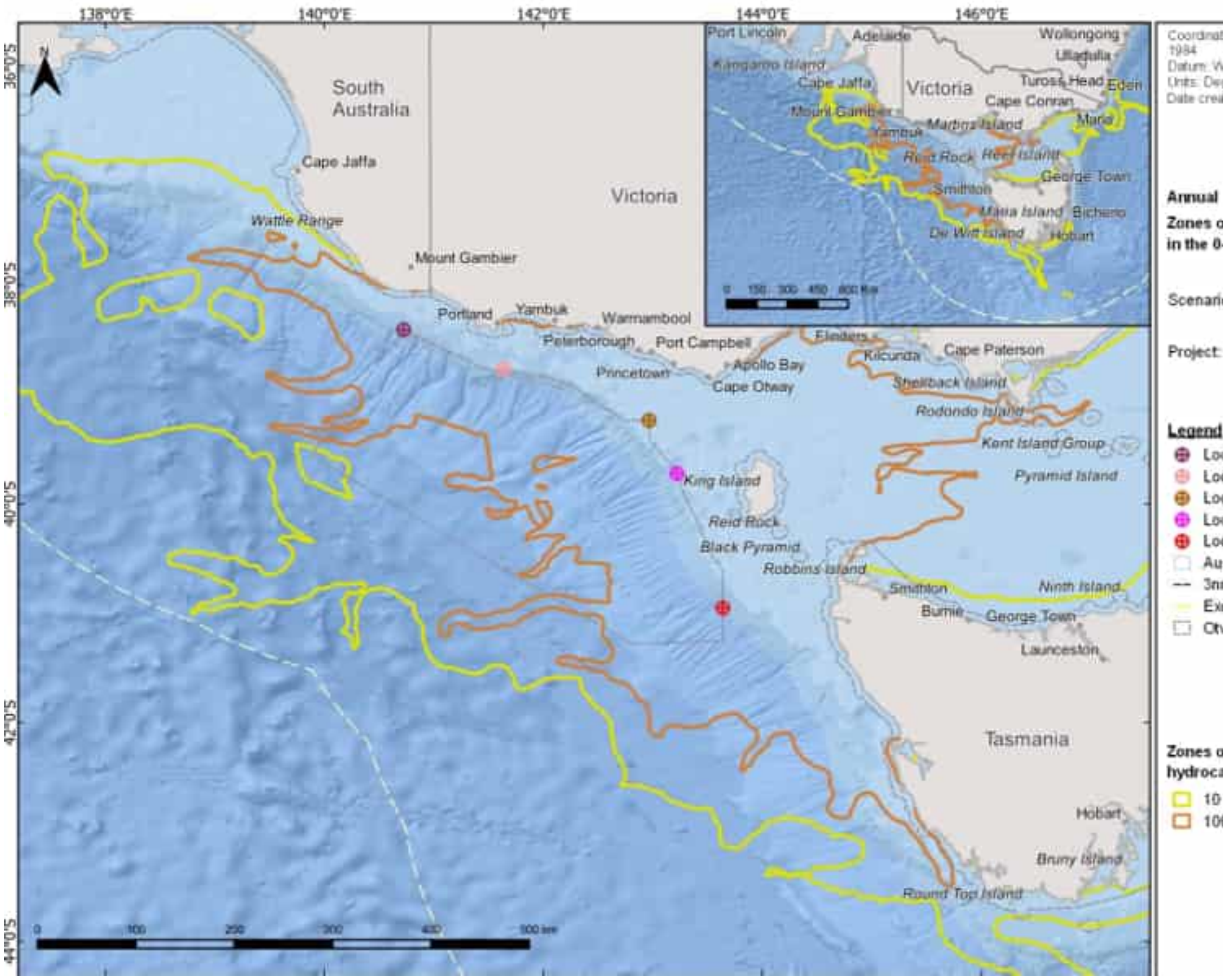


Figure 11.7 and Figure 11.8 illustrate the extent of the entrained hydrocarbon exposure in the 0-10 m and 10-20 m depth layers, based on all 500 spill simulations, respectively.

Table 11.7 Maximum entrained hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 0-10 m depth layer from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
AMP	Apollo	299	39	3	593	35	10	1,650	40	25	506	11	2	9	-	-
	Beagle	91	10	-	59	9	-	120	15	1	63	12	-	24	4	-
	Boags	33	1	-	48	2	-	6	-	-	138	11	1	492	20	4
	East Gippsland	-	-	-	8	-	-	24	1	-	6	-	-	7	-	-
	Franklin	64	3	-	134	6	1	15	1	-	216	13	3	1,588	37	17
	Huon	-	-	-	3	-	-	2	-	-	3	-	-	27	4	-
	Murray	43	3	-	24	1	-	-	-	-	-	-	-	-	-	-
	Nelson	216	3	1	129	2	1	37	2	-	24	2	-	6	-	-
	Tasman Fracture	-	-	-	3	-	-	4	-	-	5	-	-	58	4	-
	Western Kangaroo Island	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Zeehan	322	9	3	369	15	3	301	19	9	6,449	73	56	251	4	1
IBRA	Bridgewater	1,002	16	9	108	3	1	32	1	-	2	-	-	-	-	-
	East Gippsland Lowlands	-	-	-	9	-	-	43	3	-	21	1	-	7	-	-
	Flinders	87	7	-	36	8	0	70	11	-	55	9	-	29	2	-
	Gippsland Plain	40	4	-	111	10	1	68	12	-	77	4	-	-	-	-
	Glenelg Plain	1,059	18	7	121	6	1	37	1	-	2	-	-	-	-	-
	King Island	88	8	-	103	10	1	547	17	4	1,034	39	20	560	27	7
	Otway Plain	516	26	5	289	19	3	149	11	1	4	-	-	-	-	-
	Otway Ranges	358	26	6	222	18	4	187	10	2	3	-	-	-	-	-
	Strzelecki Ranges	15	2	-	54	8	-	52	12	-	33	4	-	1	-	-
	Tasmanian South East	-	-	-	2	-	-	1	-	-	1	-	-	10	1	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Tasmanian Southern Ranges	-	-	-	3	-	-	2	-	-	3	-	-	25	4	-
	Tasmanian West	11	2	-	12	1	-	49	2	-	63	3	-	316	31	5
	Warrnambool Plain	450	26	5	215	14	4	205	11	2	2	-	-	-	-	-
	Wilsons Promontory	101	11	1	51	12	-	97	16	-	154	6	1	8	-	-
IMCRA	Batemans Shelf	20	1	-	32	3	-	14	1	-	9	-	-	1	-	-
	Boags	27	1	-	66	3	-	15	1	-	90	9	-	563	22	4
	Bruny	-	-	-	2	-	-	2	-	-	4	-	-	22	3	-
	Central Bass Strait	306	34	4	528	32	11	1,172	39	21	666	24	6	445	20	4
	Central Victoria	253	37	3	593	33	11	843	33	13	122	5	1	2	-	-
	Coorong	72	6	-	31	2	-	1	-	-	-	-	-	-	-	-
	Davey	12	2	-	7	-	-	4	-	-	18	1	-	155	8	1
	Flinders	104	12	1	59	13	-	121	18	1	164	12	1	38	4	-
	Franklin	22	2	-	114	6	1	60	4	-	142	7	3	2,030	40	24
	Freycinet	-	-	-	1	-	-	3	-	-	2	-	-	14	1	-
	Otway	6,927	52	38	26,664	91	84	30,878	100	94	26,901	95	93	3,403	39	23
	Twofold Shelf	93	8	-	49	8	-	103	13	1	59	9	-	25	1	-
	Victorian Embayments	11	1	-	12	1	-	28	4	-	7	-	-	-	-	-
KEF	Big Horseshoe Canyon	-	-	-	8	-	-	13	1	-	5	-	-	6	-	-
	Bonney Coast Upwelling	2,459	35	20	1,398	12	5	107	2	1	2	-	-	-	-	-
	Seamounts South and east of Tasmania	-	-	-	2	-	-	1	-	-	1	-	-	31	1	-
	Upwelling East of Eden	47	3	-	41	5	-	55	5	-	23	4	-	11	1	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	West Tasmania Canyons	503	21	7	880	30	16	1,669	22	11	4,254	36	26	12,652	79	67
MNP	Bunurong	-	-	-	51	10	-	29	4	-	10	-	-	-	-	-
	Cape Howe	-	-	-	15	1	-	38	2	-	17	1	-	8	-	-
	Churchill Island	-	-	-	44	7	-	21	3	-	4	-	-	-	-	-
	Discovery Bay	678	15	7	128	4	1	6	-	-	2	-	-	-	-	-
	Point Addis	-	-	-	112	3	1	93	9	-	4	-	-	-	-	-
	Point Hicks	-	-	-	9	-	-	29	2	-	18	1	-	3	-	-
	Port Phillip Heads	-	-	-	32	4	-	57	7	-	1	-	-	-	-	-
	Twelve Apostles	450	29	8	222	15	5	212	7	2	3	-	-	-	-	-
	Wilsons Promontory	79	10	-	39	12	-	119	16	1	149	6	1	3	-	-
MP	Lower South East	291	6	2	42	1	-	4	-	-	1	-	-	-	-	-
MS	Marengo Reefs	43	12	-	138	12	2	139	6	1	-	-	-	-	-	-
	Merri	90	5	-	118	7	1	11	1	-	-	-	-	-	-	-
	Mushroom Reef	12	2	-	63	8	-	28	6	-	5	-	-	-	-	-
	The Arches	277	19	2	63	7	-	199	3	1	-	-	-	-	-	-
NP	Kent Group	10	1	-	35	4	-	18	3	-	59	8	-	12	1	-
NPS4	Bunurong Marine Park	-	-	-	46	8	-	37	3	-	3	-	-	-	-	-
	Corner Inlet Marine and Coastal Park	-	-	-	13	1	-	31	4	-	8	-	-	-	-	-
	Shallow Inlet Marine and Coastal Park	-	-	-	14	2	-	26	2	-	9	-	-	-	-	-
	Wilsons Promontory Marine Park	14	5	-	49	9	-	68	10	-	77	4	-	-	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Wilsons Promontory Marine Reserve	21	7	-	36	12	-	56	14	-	87	5	-	-	-	-
Ramsar	Corner Inlet	-	-	-	13	1	-	31	4	-	8	-	-	-	-	-
Ramsar	Glenelg Estuary and Discovery Bay Wetlands	209	9	2	89	1	-	3	-	-	1	-	-	-	-	-
Ramsar	Lavinia	-	-	-	17	1	-	25	2	-	26	6	-	8	-	-
Ramsar	Piccaninnie Ponds Karst Wetlands	107	3	1	17	1	-	2	-	-	-	-	-	-	-	-
Ramsar	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula	-	-	-	75	3	-	60	6	-	1	-	-	-	-	-
Ramsar	The Coorong, and Lakes Alexandrina and Albert Wetland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramsar	Western Port	-	-	-	44	7	-	27	3	-	4	-	-	-	-	-
RSB	Bell Reef	19	3	-	14	1	-	36	3	-	217	25	3	192	1-	2
RSB	Bravenes Rock	109	27	2	346	14	4	334	12	3	4	-	-	-	-	-
RSB	Brown Rocks	-	-	-	7	-	-	25	1	-	12	1	-	302	21	4
RSB	Cody Bank	17	3	-	58	9	-	31	11	-	42	1	-	-	-	-
RSB	Cutter Rock	24	8	-	51	7	-	78	15	-	28	2	-	10	1	-
RSB	Endeavour Reef	-	-	-	3	-	-	7	-	-	12	1	-	17	1	-
RSB	New Zealand Star Bank	13	2	-	19	2	-	44	4	-	18	1	-	7	-	-
RSB	Wakitipu Rock	-	-	-	10	1	-	10	-	-	8	-	-	25	1	-
RSB	Warrego Rock	-	-	-	1	-	-	7	-	-	33	1	-	9	-	-

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
	Wright Rock	-	-	-	8	-	-	6	-	-	13	1	-	23	1	-
State Waters	New South Wales	11	1	-	15	1	-	33	1	-	14	1	-	9	-	-
	South Australia	330	7	3	55	3	-	4	-	-	1	-	-	-	-	-
	Tasmania	93	10	-	131	14	2	707	25	6	1,224	40	25	641	35	11
	Victoria State	1562	31	11	416	24	6	453	18	3	163	6	1	12	1	-
Nearshore waters	Albatross Island	-	-	-	71	3	-	21	1	-	48	5	-	589	22	5
	Anser Island	37	8	-	23	11	-	75	13	-	126	4	1	1	0	-
	Bass Coast	-	-	-	65	8	-	43	4	-	4	-	-	-	0	-
	Bega Valley	-	-	-	9	-	-	34	1	-	13	1	-	7	0	-
	Black Pyramid	51	2	-	19	1	-	11	1	-	163	13	2	413	19	6
	Bruny Island	-	-	-	1	-	-	1	-	-	1	-	-	10	1	-
	Chalky Island	-	-	-	-	-	-	-	-	-	1	-	-	15	1	-
	Circular Head	-	-	-	14	1	-	27	2	-	63	3	-	340	27	7
	Colac Otway	516	26	6	289	19	3	155	11	1	2	-	-	-	-	-
	Coorong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Corangamite	450	26	6	218	14	4	205	11	2	2	-	-	-	-	-
	Craggy Island	-	-	-	1	-	-	6	-	-	26	1	-	9	-	-
	Curtis Island	11	1	-	34	5	-	70	10	-	50	9	-	20	2	-
	De Witt Island	-	-	-	4	-	-	2	-	-	8	-	-	50	5	-
	East Gippsland	-	-	-	8	-	-	35	3	-	21	1	-	6	-	-
	East Kangaroo Island	-	-	-	-	-	-	-	-	-	1	-	-	11	1	-
	Flinders Island	-	-	-	1	-	-	1	-	-	5	-	-	14	1	-
	French Island	-	-	-	29	2	-	12	1	-	2	-	-	-	-	-
	Gabo Island	-	-	-	8	-	-	43	2	-	17	1	-	6	-	-
	Glenelg	1,059	31	7	121	6	1	55	1	-	2	-	-	-	-	-
	Glennie Group	30	9	-	36	12	-	69	16	-	87	6	-	1	-	-

Receptor	Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
Grant	229	5	1	38	2	-	3	-	-	-	-	-	-	-	-
Greater Geelong	-	-	-	123	4	1	75	7	-	2	-	-	-	-	-
Hogan Island Group	87	7	-	36	8	-	70	11	-	2-	3	-	8	-	-
Hunter Island	-	-	-	15	1	-	26	1	-	12	3	-	355	19	6
Huon Valley	10	1	-	5	-	-	2	-	-	17	1	-	53	8	-
Kangaroo Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kanowna Island	54	10	-	23	11	-	97	14	-	154	4	1	1	-	-
Kent Island Group	11	1	-	35	4	-	19	3	-	55	9	-	13	1	-
King Island	88	8	-	103	10	1	547	17	5	12,420	39	2	26	2	-
Kingston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lady Julia Percy Island	61	16	-	131	6	2	97	1	-	1	-	-	-	-	-
Laurence Rocks	240	15	4	167	6	2	35	1	-	2	-	-	-	-	-
Maatsuyker Island	-	-	-	6	-	-	3	-	-	1-	-	-	63	5	-
Mewstone	-	-	-	3	-	-	2	-	-	4	-	-	17	4	-
Moncoeur Islands	97	10	-	39	9	-	83	15	-	45	4	-	8	-	-
Mornington Peninsula	40	4	-	68	8	-	49	9	-	5	-	-	-	-	-
Moyne	396	25	5	215	9	3	157	5	1	1	-	-	-	-	-
Mud Island	-	-	-	15	2	-	20	4	-	1	-	-	-	-	-
Norman Island	17	6	-	48	11	-	60	11	-	101	4	1	-	-	-
Outer Sister Island	-	-	-	1	-	-	1	-	-	14	1	-	6	-	-
Pasco Group	-	-	-	1	-	-	-	-	-	1	-	-	18	1	-
Phillip Island	12	1	-	111	9	1	41	6	-	8	-	-	-	-	-

Receptor	Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
Prime Seal Island	-	-	-	1	-	-	-	-	-	1	-	-	18	1	-
Pyramid Island	-	-	-	20	1	-	9	-	-	1-	-	-	29	1	-
Reef Island	-	-	-	-	-	-	-	-	-	1	-	-	11	1	-
Reid Rock	20	3	-	56	5	-	36	3	-	248	31	6	155	9	2
Robbins Island	-	-	-	7	-	-	2	-	-	3	-	-	19	1	-
Robe	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Rodondo Island	101	11	1	40	7	-	90	15	-	82	4	-	8	-	-
Round Top Island	-	-	-	4	-	-	3	-	-	6	-	-	40	4	-
Seal Islands	11	1	-	15	1	-	31	3	-	52	1	-	1	-	-
Shellback Island	11	5	-	51	9	-	68	10	-	79	4	-	-	-	-
Skull Rock	53	10	-	23	11	-	95	15	-	148	4	1	1	-	-
South Gippsland	39	8	-	57	11	-	68	12	-	113	4	1	1	-	-
Surf Coast	-	-	-	107	3	1	87	8	-	4	-	-	-	-	-
The Pages	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
Three Hummock Island	-	-	-	26	1	-	10	0	-	7	-	-	100	14	-
Warrnambool	290	10	1	155	7	2	16	1	-	1	-	-	-	-	-
Wattle Range	-	-	-	8	-	-	1	0	-	-	-	-	-	-	-
Wellington	-	-	-	1	-	-	10	1	-	2	-	-	-	-	-
West Coast	11	2	-	12	1	-	49	2	-	45	3	-	316	31	5

Table 11.8 Maximum entrained hydrocarbon concentrations and probabilities of exposure to sensitive receptors in the 10-20 m depth layer from an MDO survey vessel tank rupture at the five selected release locations. The results were derived from 100 spill simulations per location and presented as an annual assessment.

Receptor		Release Location 1			Release Location 2			Release Location 3			Release Location 4			Release Location 5		
		Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High	Max conc (ppb)	Low	High
AMP	Apollo	-	-	-	6	-	-	18	2	-	5	-	-	-	-	-
	Nelson	-	-	-	3	-	-	1	-	-	1	-	-	-	-	-
	Zeehan	-	-	-	6	-	-	4	-	-	15	3	-	4	-	-
IMCRA	Coorong	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Franklin	-	-	-	2	-	-	2	-	-	2	-	-	11	1	-
	Otway	18	1	-	18	3	-	18	4	-	20	3	-	11	1	-
KEF	Bonney Coast Upwelling	15	1	-	8	-	-	3	-	-	-	-	-	-	-	-
	West Tasmania Canyons	-	-	-	11	1	-	8	-	-	12	1	-	14	2	-
State Waters	Tasmania	-	-	-	2	-	-	7	-	-	10	1	-	7	-	-

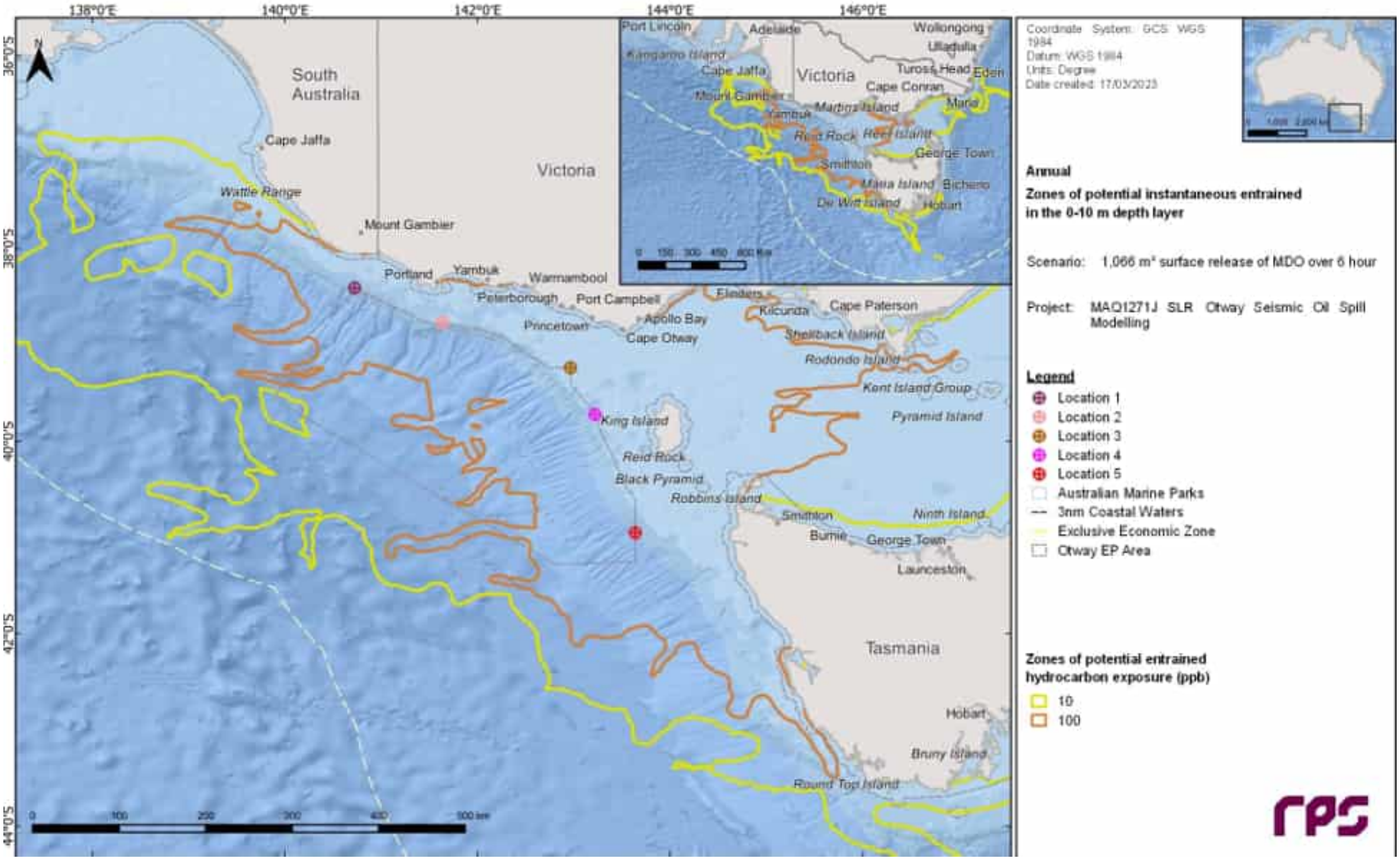


Figure 11.7 **Zones of potential entrained hydrocarbon exposure in the 0-10 m depth layer from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.**

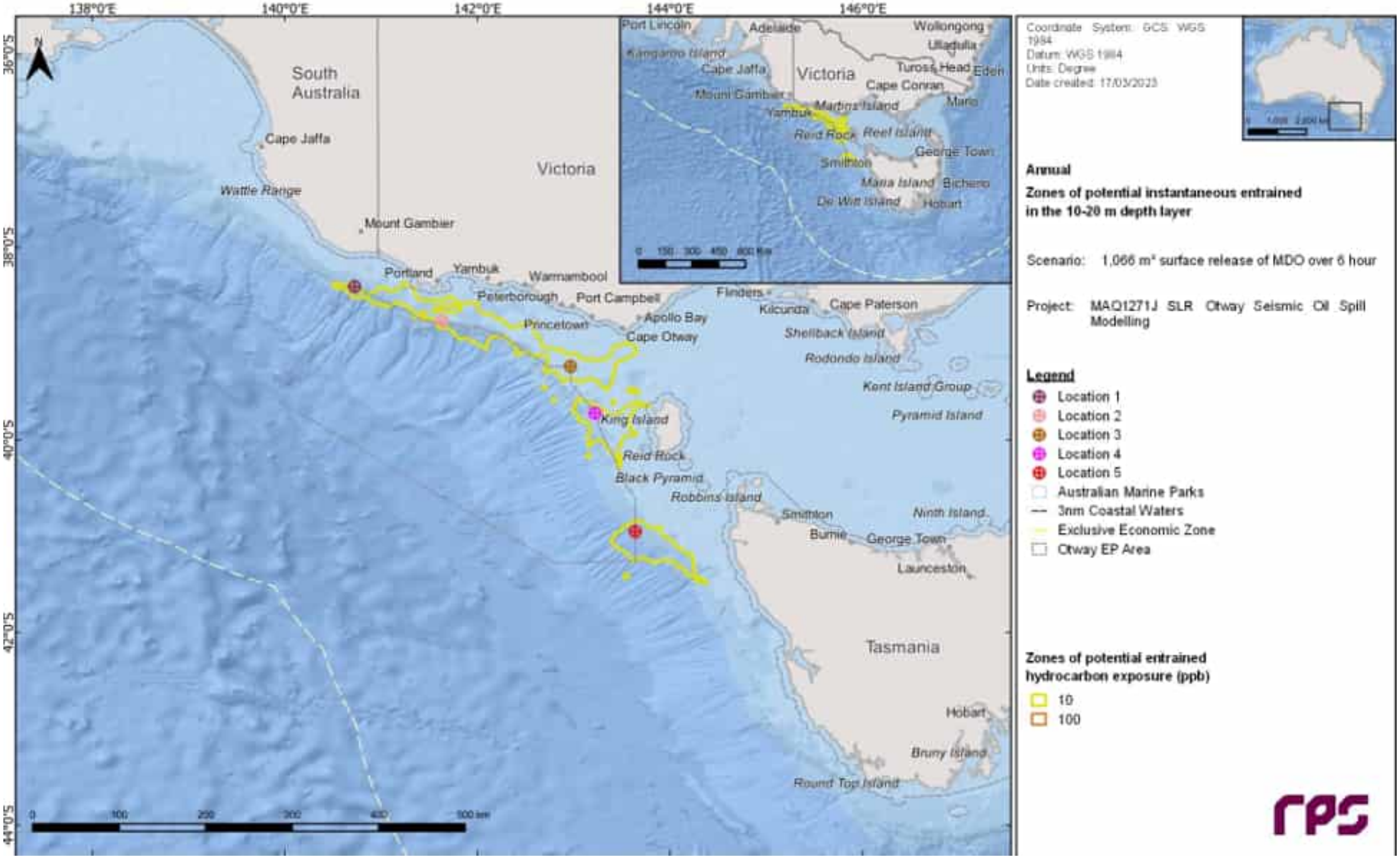


Figure 11.8 **Zones of potential entrained hydrocarbon exposure in the 10-20 m depth layer from an MDO survey vessel tank rupture. The results were derived from 100 spill simulations per location and presented as an annual assessment.**

11.3 Deterministic Analysis

As previously mentioned, at each of the five selected locations (100 spill simulations per location) the deterministic runs resulting in the maximum volume of oil ashore were identified and presented in Sections 11.3.1 to 11.3.5, respectively. In addition, the single simulation that resulted in the largest swept area above the low threshold of 1 g/m^2 from all 500 simulations was identified and is presented in Section 11.3.6.

11.3.1 Location 1 maximum volume of oil ashore

The simulation that resulted in the maximum volume of oil ashore of 126.5 m^3 from Location 1 was identified as run number 89, which commenced at 5 am 13th July 2019.

Figure 11.9 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.10 presents the area of floating oil over time for each threshold during the 50 day simulation. The moderate oil exposure dropped below the respective threshold of 10 g/m^2, 6 hours after the release duration.

Figure 11.11 presents the maximum volume ashore for each threshold. The maximum volume of oil ashore was 126.5 m^3, which occurred on day 20.

Figure 11.12 presents the fates and weathering for the corresponding simulation. At the conclusion of the simulation (day-50), approximately 454 m^3 (43%) was lost to the atmosphere through evaporation. Additionally, approximately 410 m^3 (38%) decayed, <1 m^3 (<1%) remained on the surface and 99 m^3 (9%) was entrained within the water column. There was 113 m^3 (11%) remaining on the shorelines at the conclusion of the simulation.

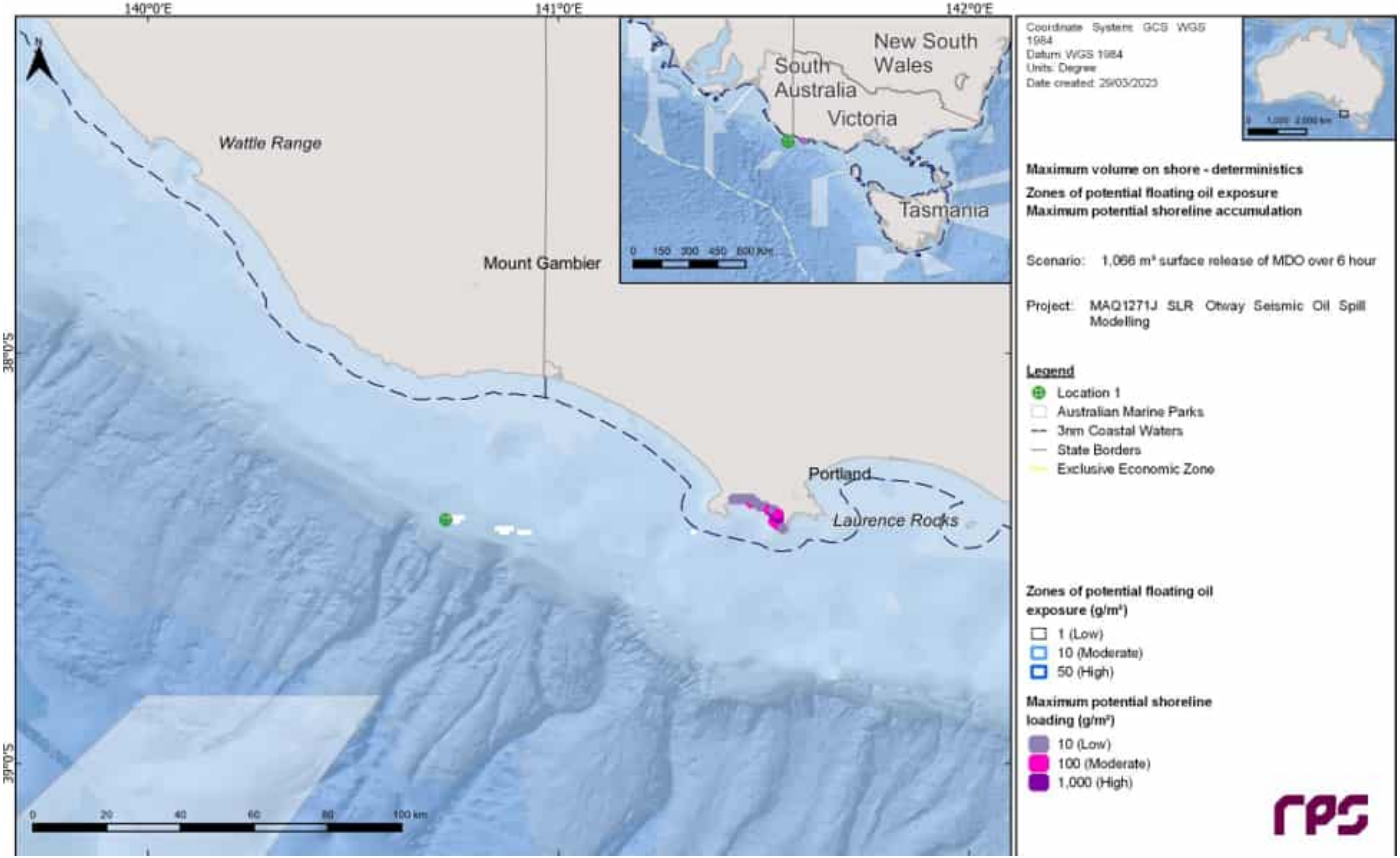


Figure 11.9 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 1.

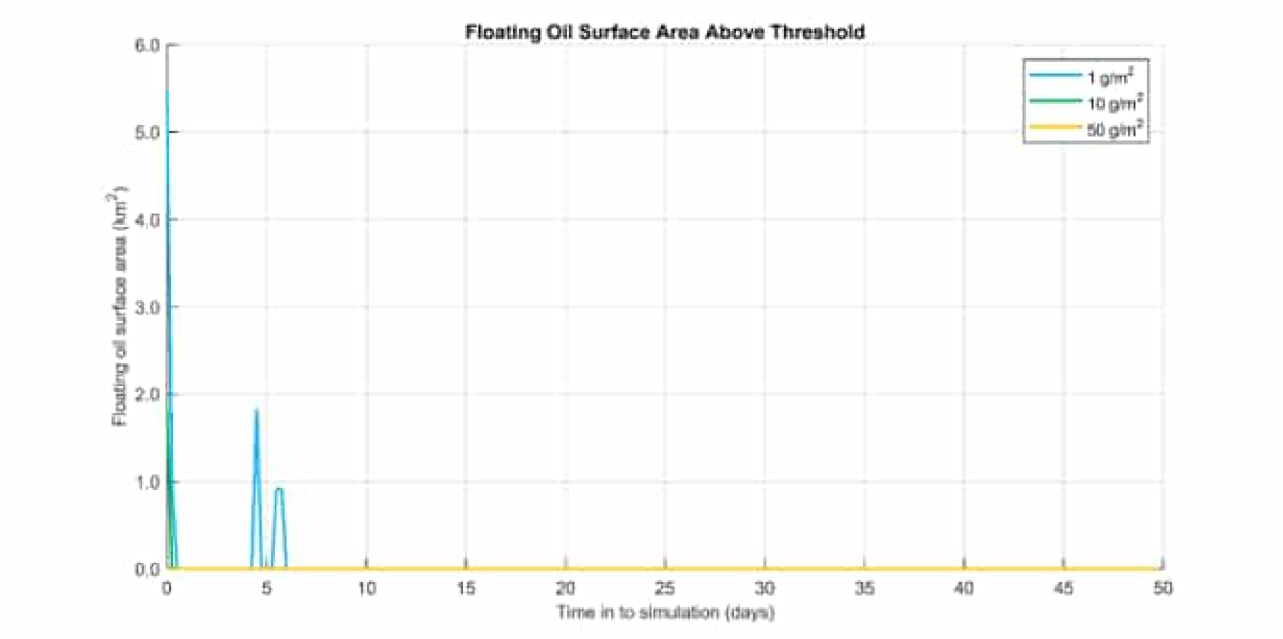


Figure 11.10 **Predicted area of floating oil for each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 1**

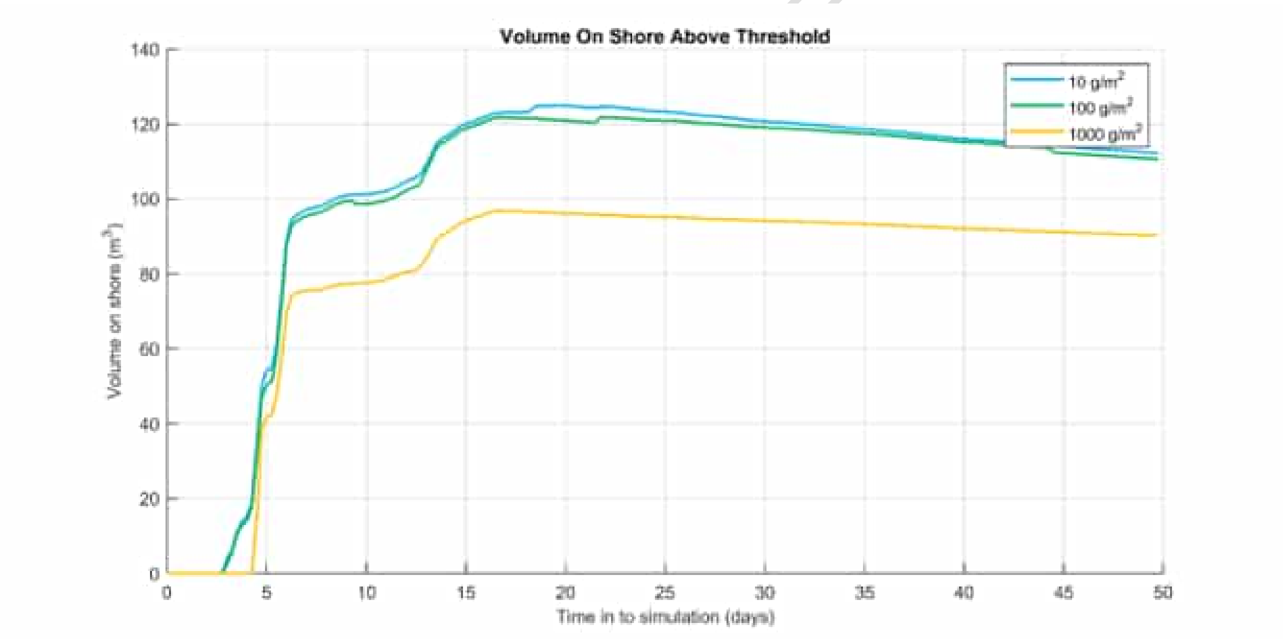


Figure 11.11 **Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 1.**

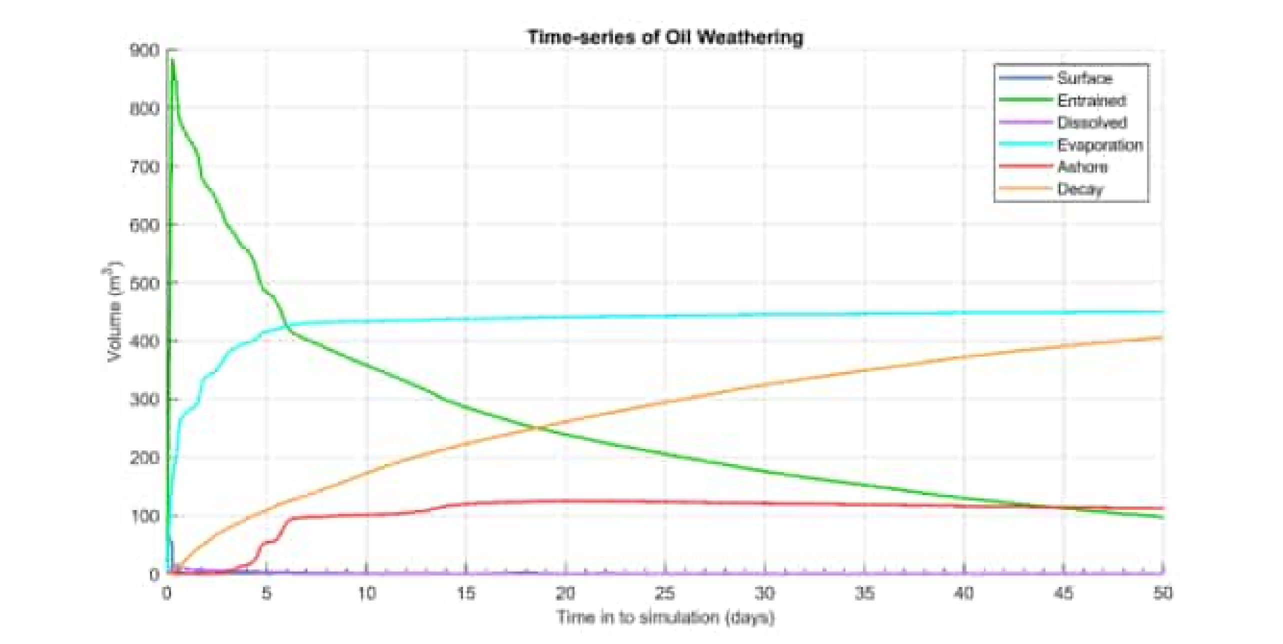


Figure 11.12 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 1.

11.3.2 Location 2 maximum volume of oil ashore

The simulation that resulted in the maximum volume of oil ashore of 28.7 m^3 from Location 2 was identified as run number 49, which commenced at 7 am 24th May 2019.

Figure 11.13 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.14 presents the area of floating oil over time for each threshold during the 50 day simulation. The floating oil exposure had dropped below the low threshold of 1 g/m^2 immediately after the 6 hour release duration.

Figure 11.15 presents the maximum volume ashore for each threshold. The maximum volume of oil ashore was 28.7 m^3, which occurred on day 14.

Figure 11.16 presents the fates and weathering for the corresponding simulation. At the conclusion of the simulation (day-50), approximately 500 m^3 (47%) was lost to the atmosphere through evaporation. Additionally, approximately 436 m^3 (41%) decayed, <1 m^3 (<1%) remained on the surface and 113 m^3 (11%) was entrained within the water column. There was 16 m^3 (2%) remaining on the shorelines.

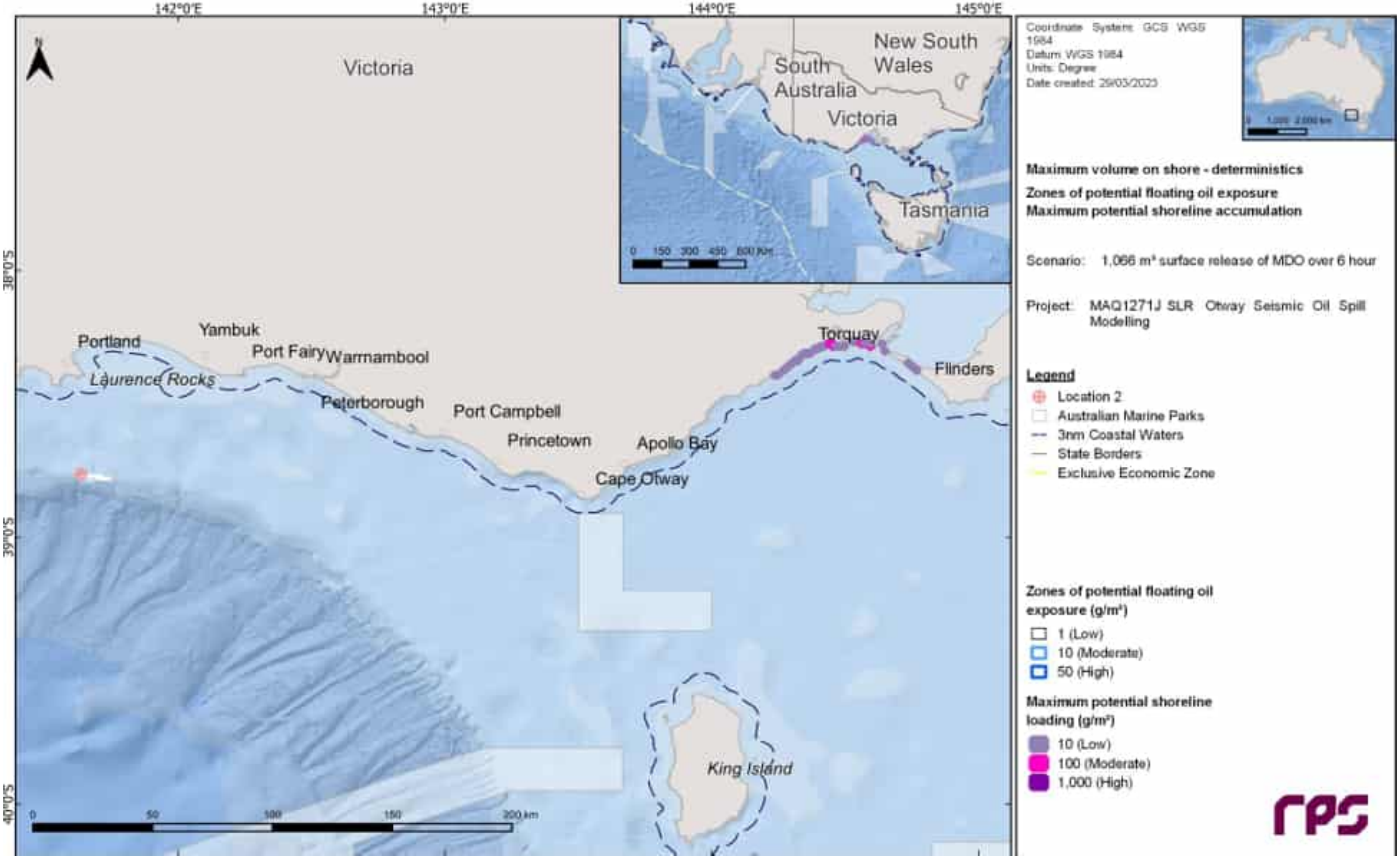


Figure 11.13 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 2.

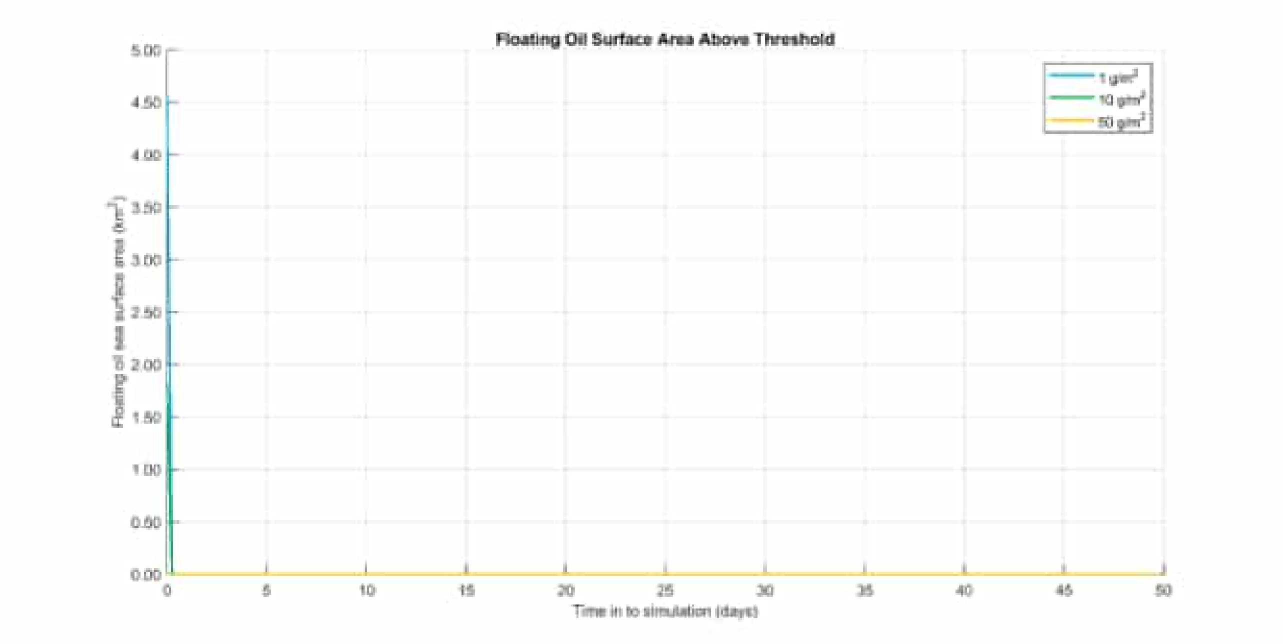


Figure 11.14 Predicted area of floating oil for each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 2.

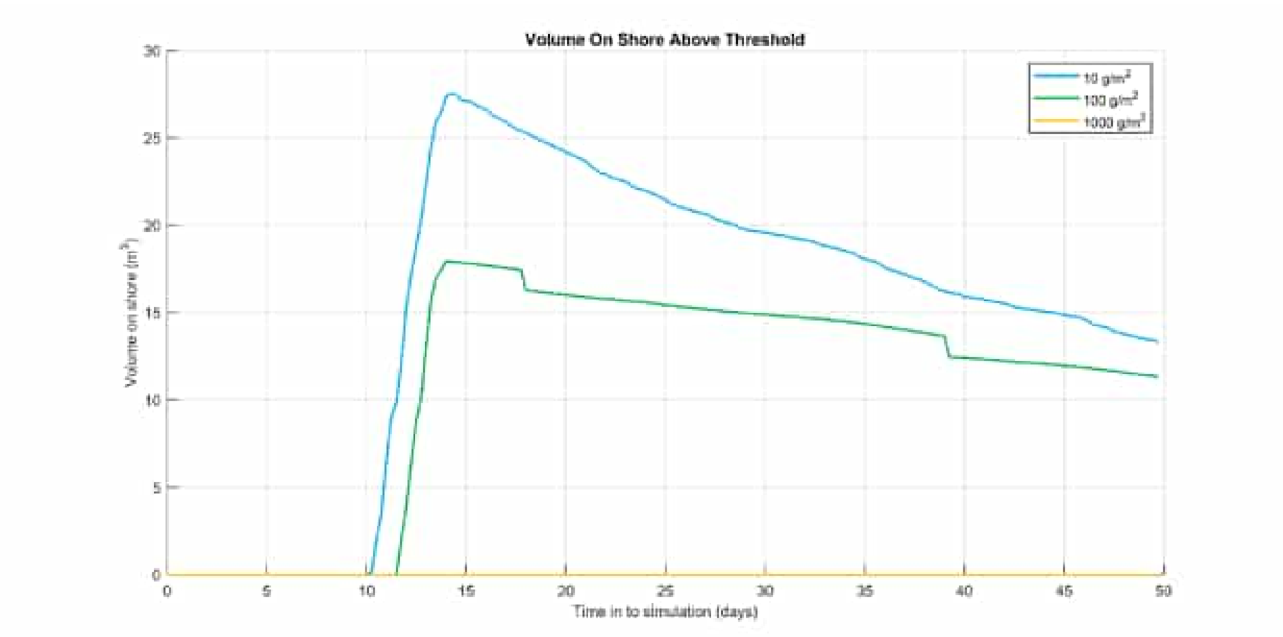


Figure 11.15 Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 2.

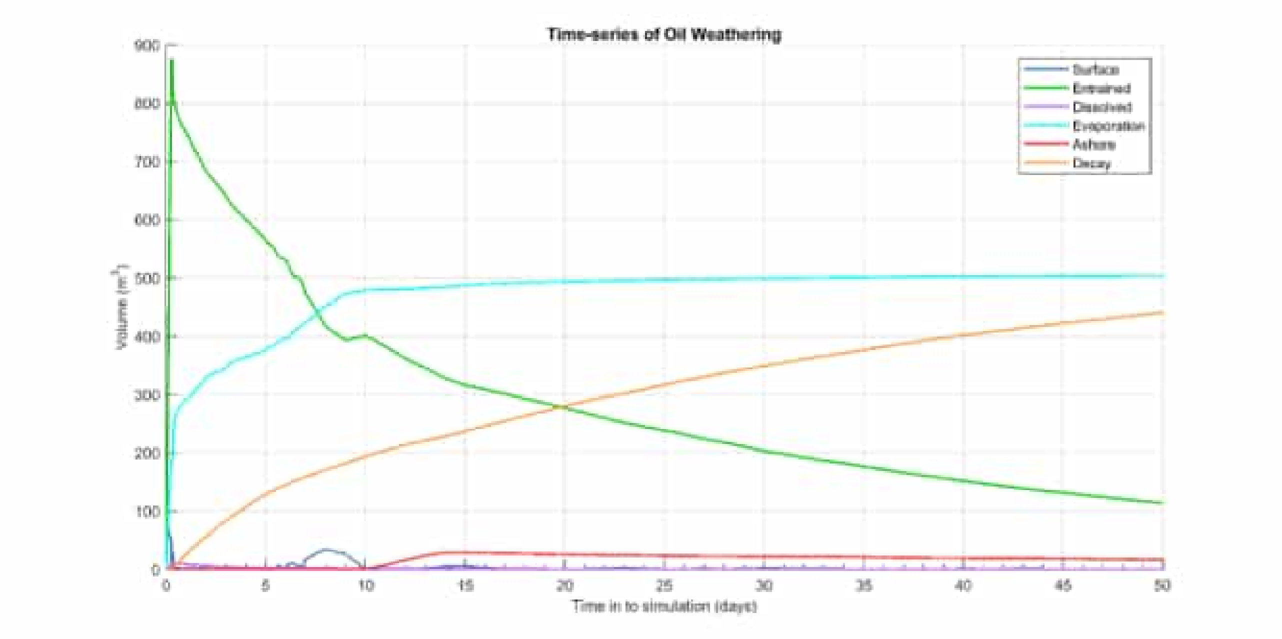


Figure 11.16 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 2.

11.3.3 Location 3 maximum volume of oil ashore

The simulation that resulted in the maximum volume of oil ashore of 68 m^3 from Location 3 was identified as run number 43, which commenced at 12 pm 20th July 2019.

Figure 11.17 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.18 presents the area of floating oil over time for each threshold during the 50 day simulation. The floating oil exposure had dropped below the low threshold of 1 g/m^2 immediately after the 6 hour release duration and spiked back up again around day 5.

Figure 11.19 presents the maximum volume ashore for each threshold. The maximum volume of oil ashore was 68 m^3, which occurred on day 19.

Figure 11.20 presents the fates and weathering for the corresponding simulation. At the conclusion of the simulation (day-50), approximately 520 m^3 (49%) was lost to the atmosphere through evaporation. Additionally, approximately 398 m^3 (37%) decayed, <1 m^3 (<1%) remained on the surface and 93 m^3 (9%) was entrained within the water column. There was 53 m^3 (5%) remaining on the shorelines.

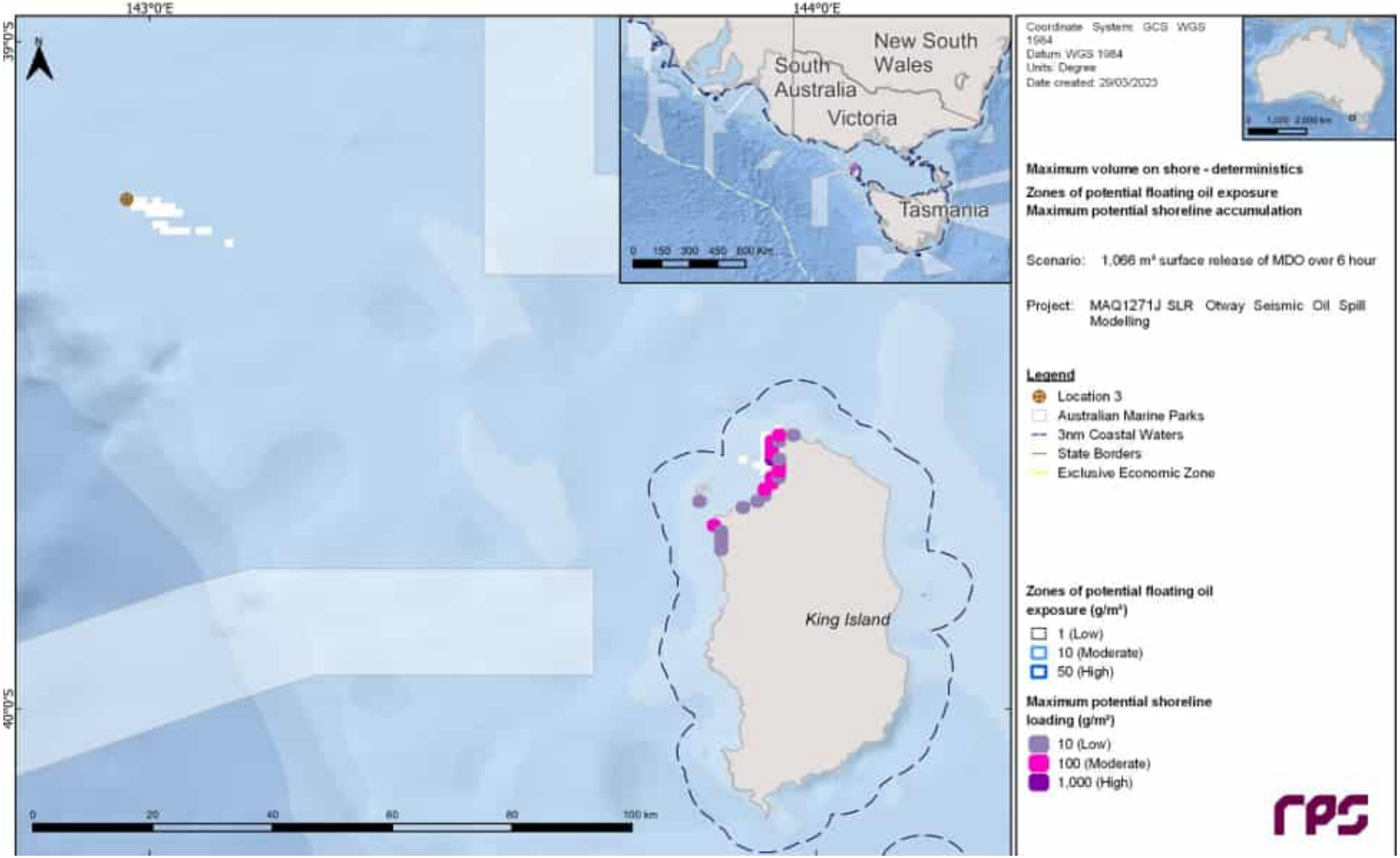


Figure 11.17 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 3.

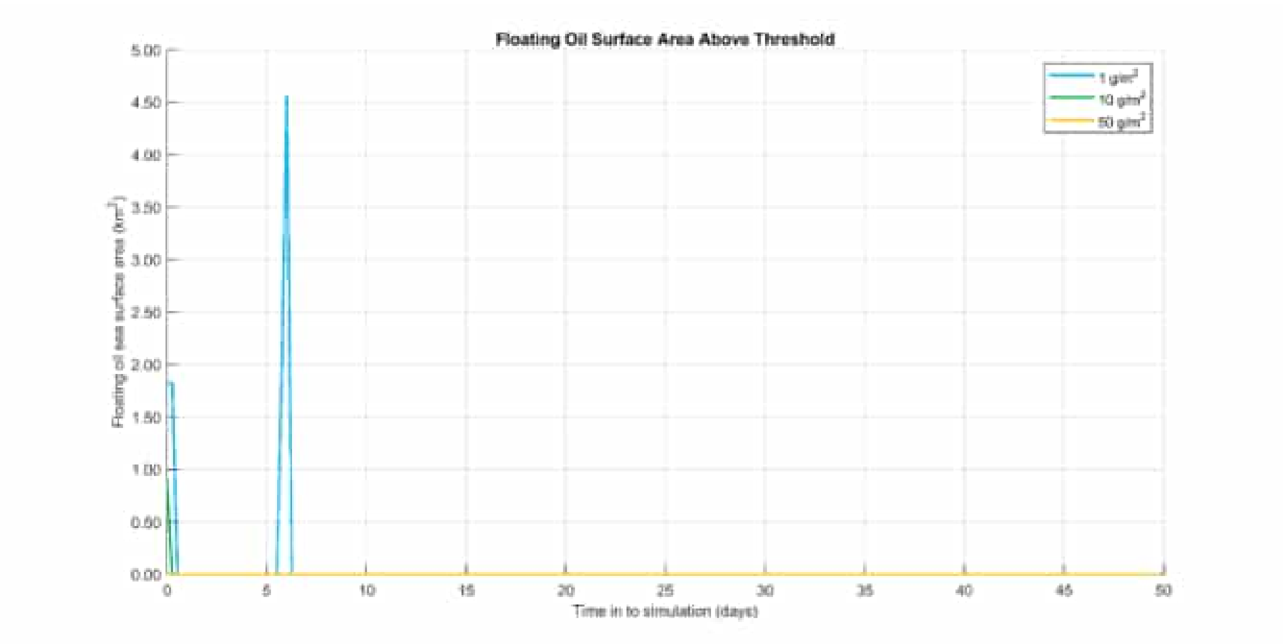


Figure 11.18 Predicted area of floating oil for each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 3.

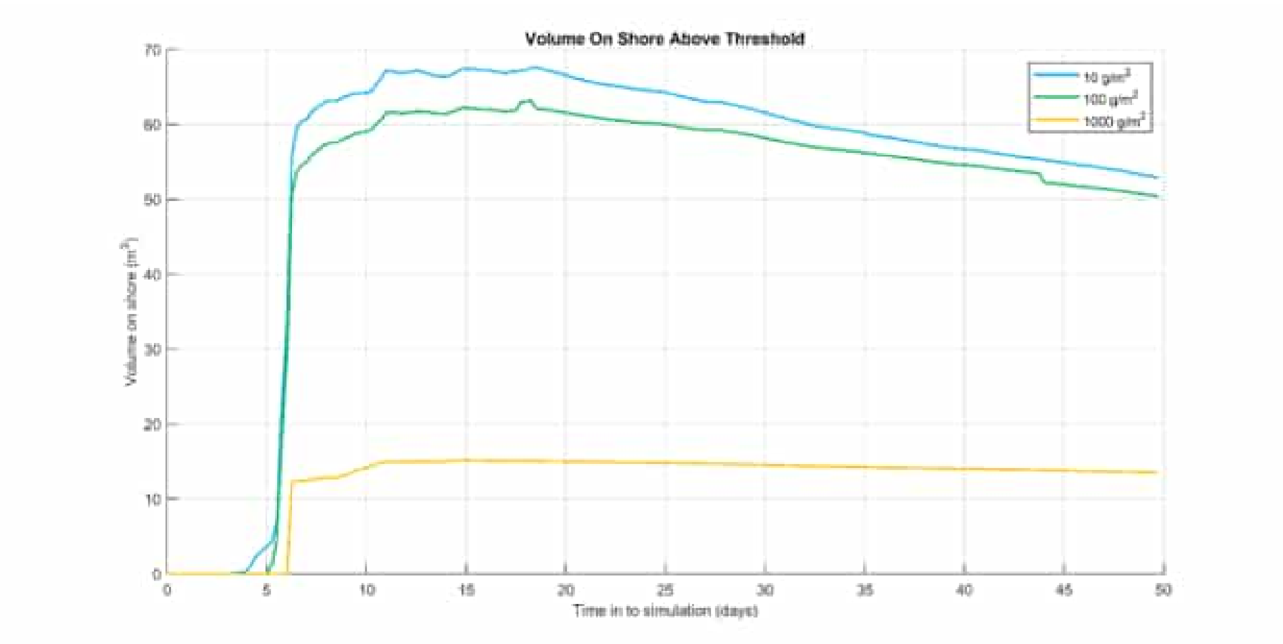


Figure 11.19 Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 3.

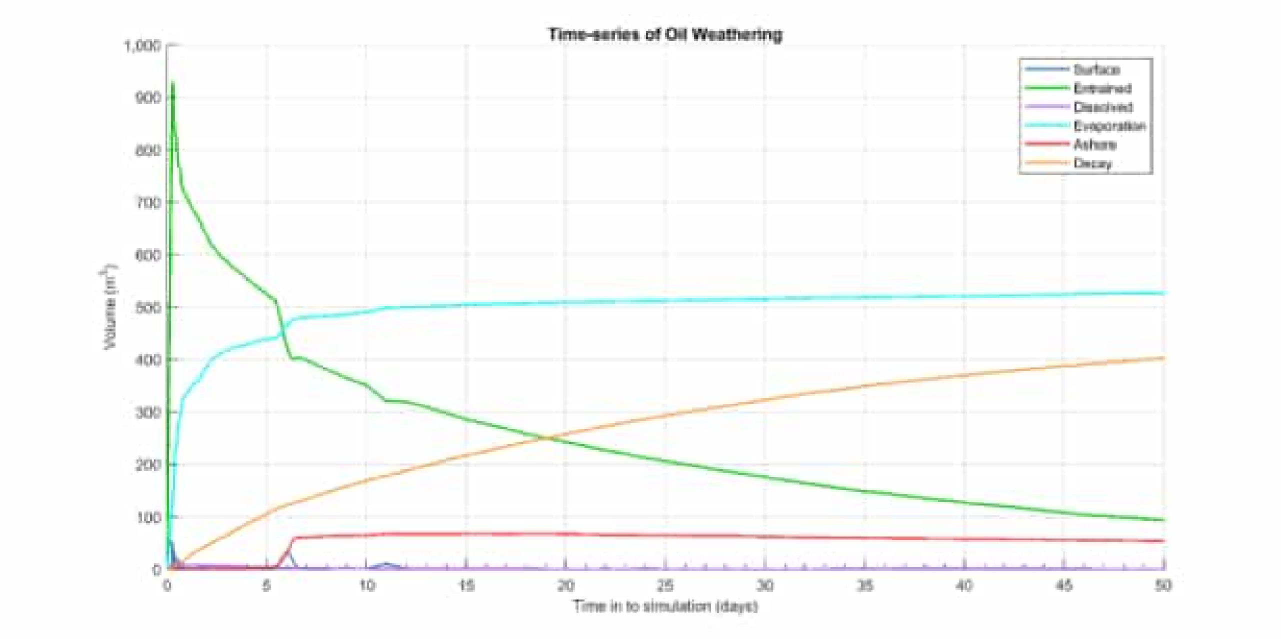


Figure 11.20 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 3.

11.3.4 Location 4 maximum volume of oil ashore

The simulation that resulted in the maximum volume of oil ashore of 66.2 m^3 from Location 4 was identified as run number 41, which commenced at 4 pm 1st November 2016.

Figure 11.21 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.22 presents the area of floating oil over time for each threshold during the 50 day simulation The floating oil exposure had dropped below the low threshold of 1 g/m^2 immediately after day-2 and spiked back up again around day 7 for an additional day.

Figure 11.23 presents the maximum volume ashore for each threshold. The maximum volume of oil ashore was 66.2 m^3, which occurred on day 10.

Figure 11.24 presents the fates and weathering for the corresponding simulation. At the conclusion of the simulation (day-50), approximately 472 m^3 (44%) evaporated, 439 m^3 (41%) decayed, <0 m^3 (<1%) remained on the surface and 109 m^3 (10%) was entrained within the water column. There was 45 m^3 (4%) remaining on the shorelines.

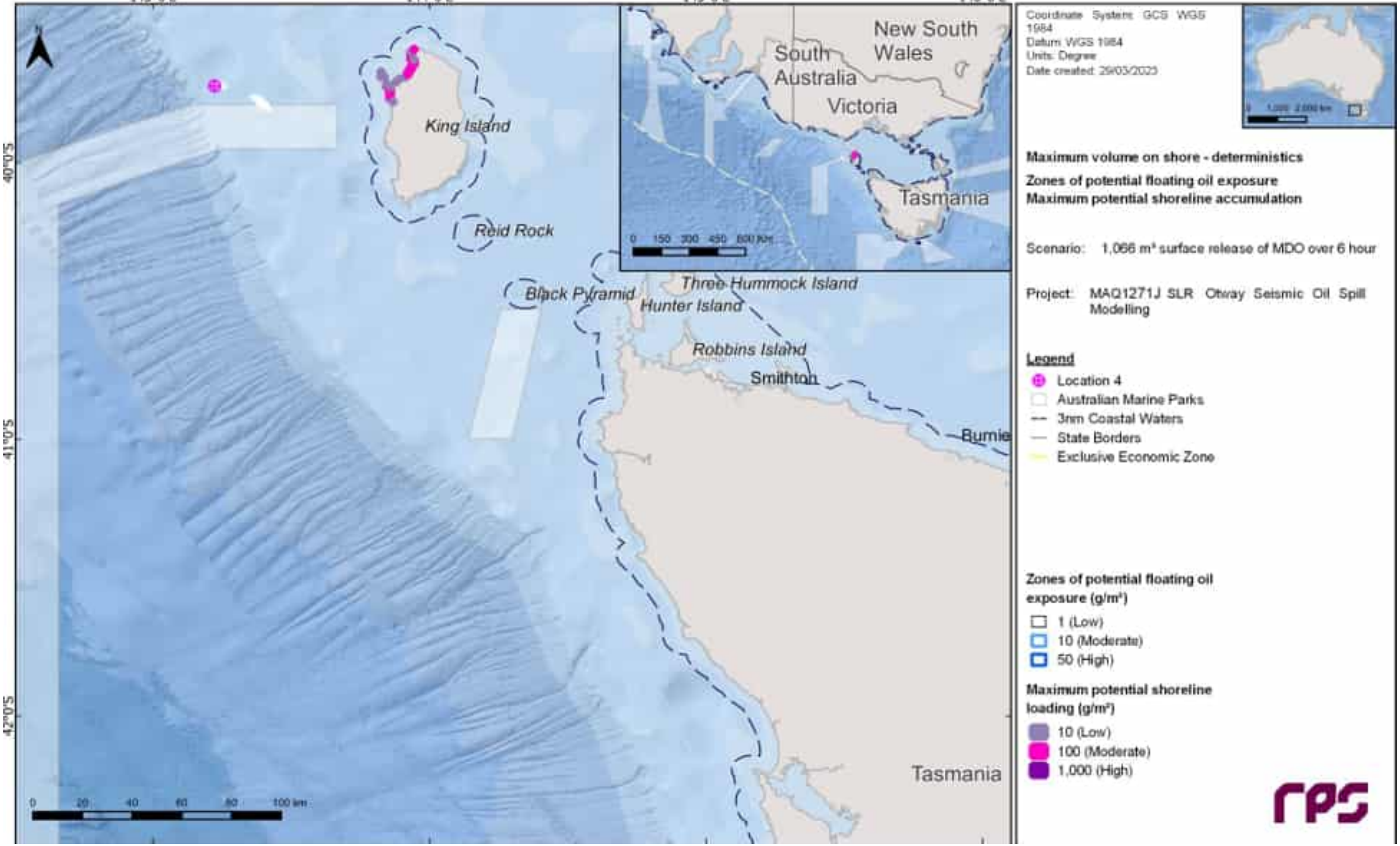


Figure 11.21 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 4.

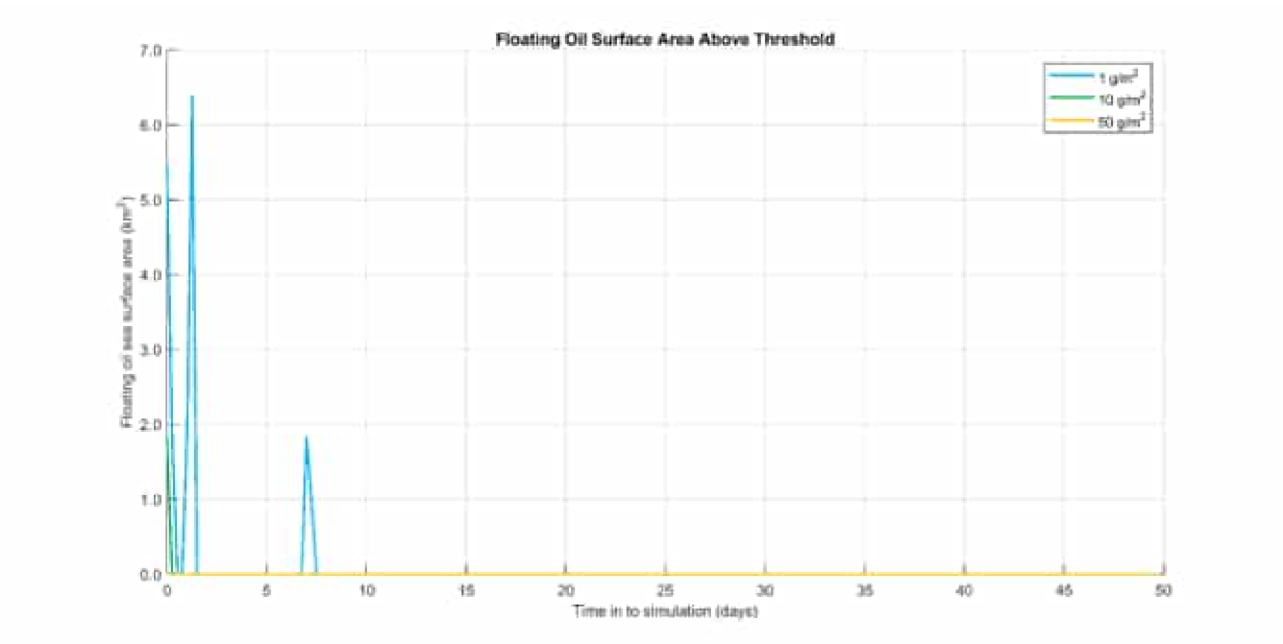


Figure 11.22 Predicted area of floating oil for each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 4.

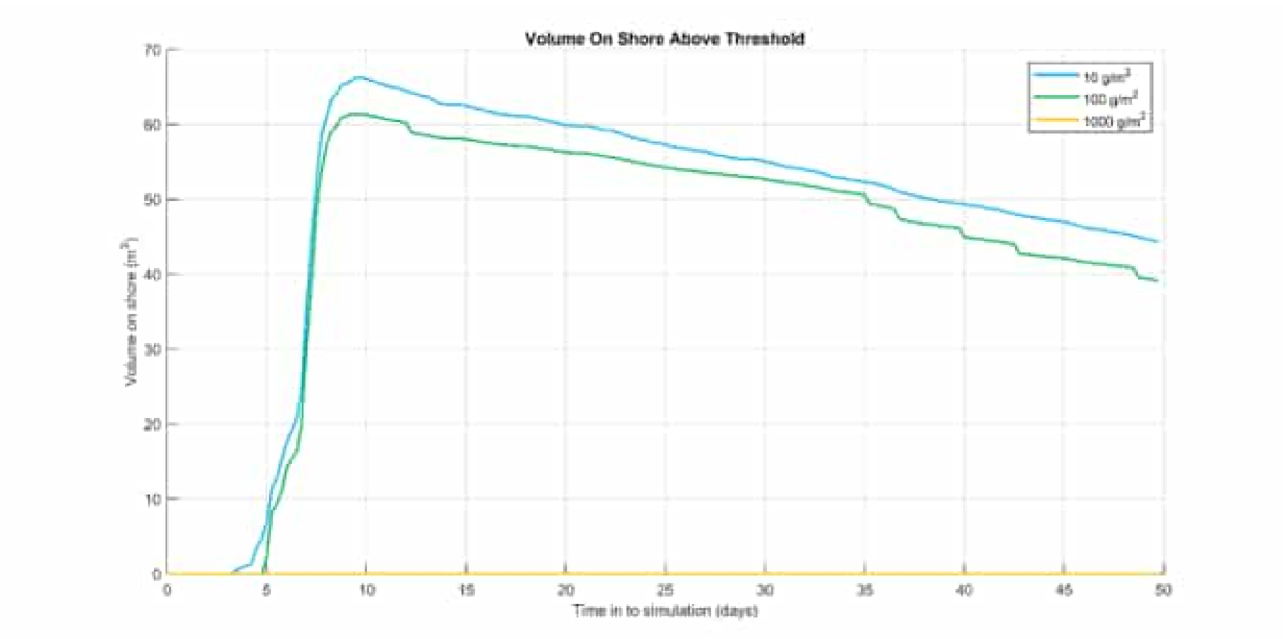


Figure 11.23 Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 4.

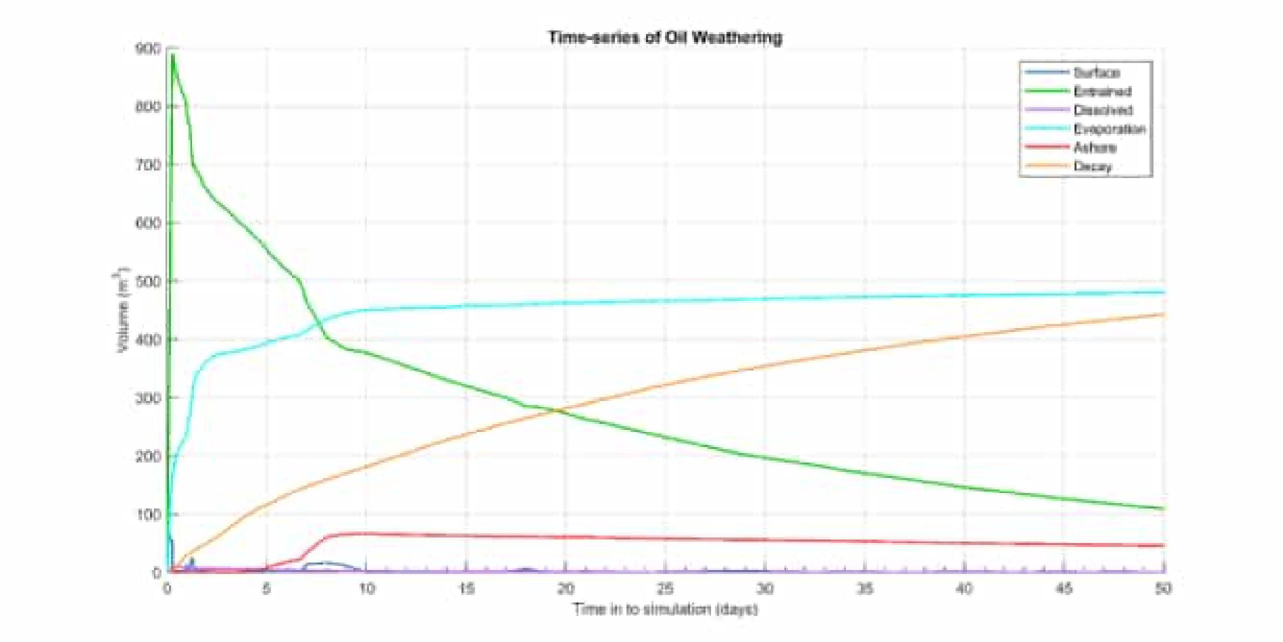


Figure 11.24 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 4.

11.3.5 Location 5 maximum volume of oil ashore

The simulation that resulted in the maximum volume of oil ashore of 46.5 m^3 from Location 1 was identified as run number 28, which commenced at 9 pm 20th May 2019.

Figure 11.25 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.26 presents the area of floating oil over time for each threshold during the 50 day simulation. The floating oil exposure had dropped below the low threshold of 1 g/m^2 less than 2 days after the initial release.

Figure 11.27 presents the maximum volume ashore for each threshold. The maximum volume of oil ashore was 46.5 m^3, which occurred on day 19.

Figure 11.28 presents the fates and weathering for the corresponding simulation At the conclusion of the simulation (day-50), approximately 494 m^3 (46%) evaporated, 439 m^3 (41%) decayed, <0 m^3 (<1%) remained on the surface and 106 m^3 (10%) was entrained within the water column. There was 26 m^3 (2%) remaining on the shorelines.

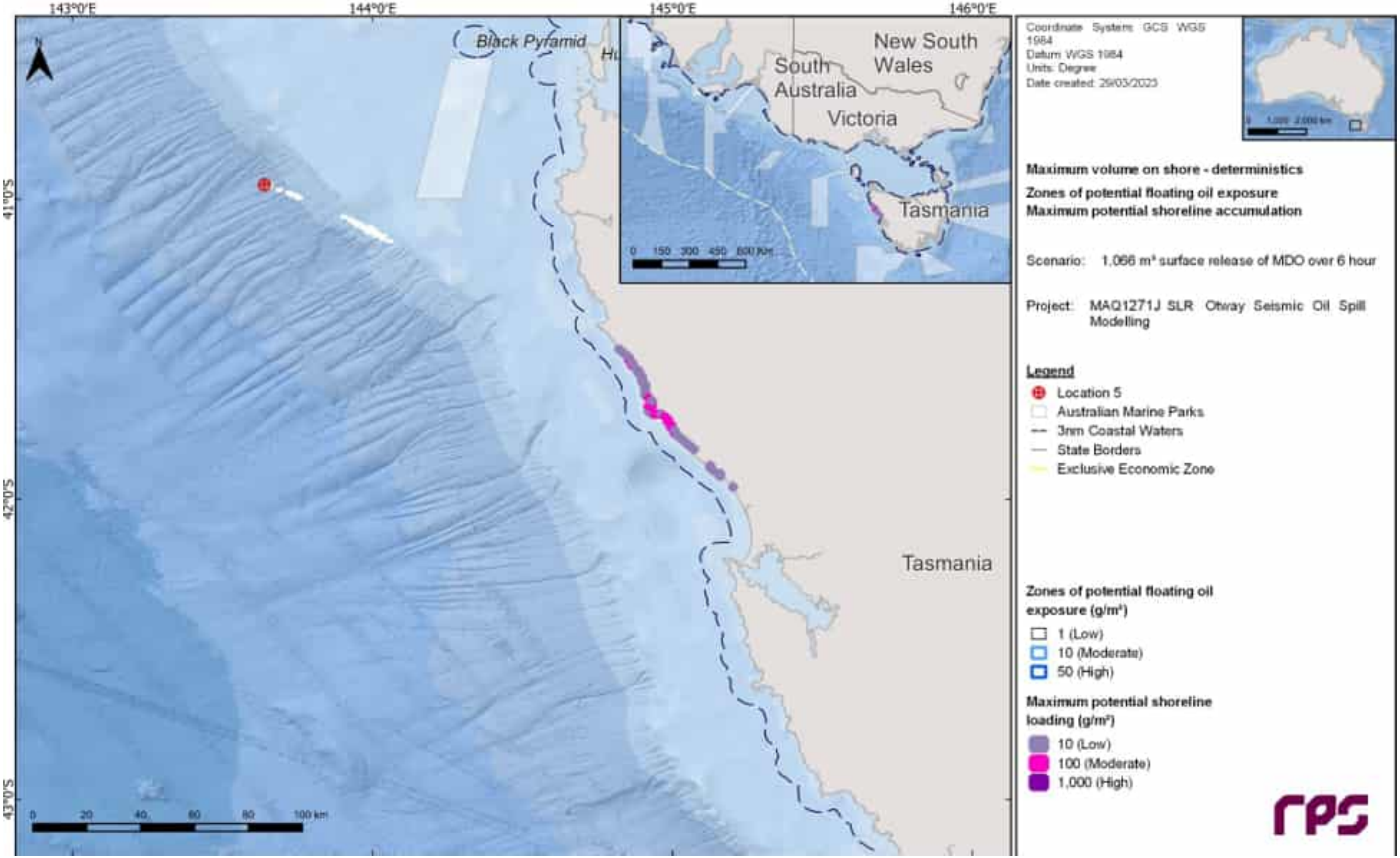


Figure 11.25 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 5.

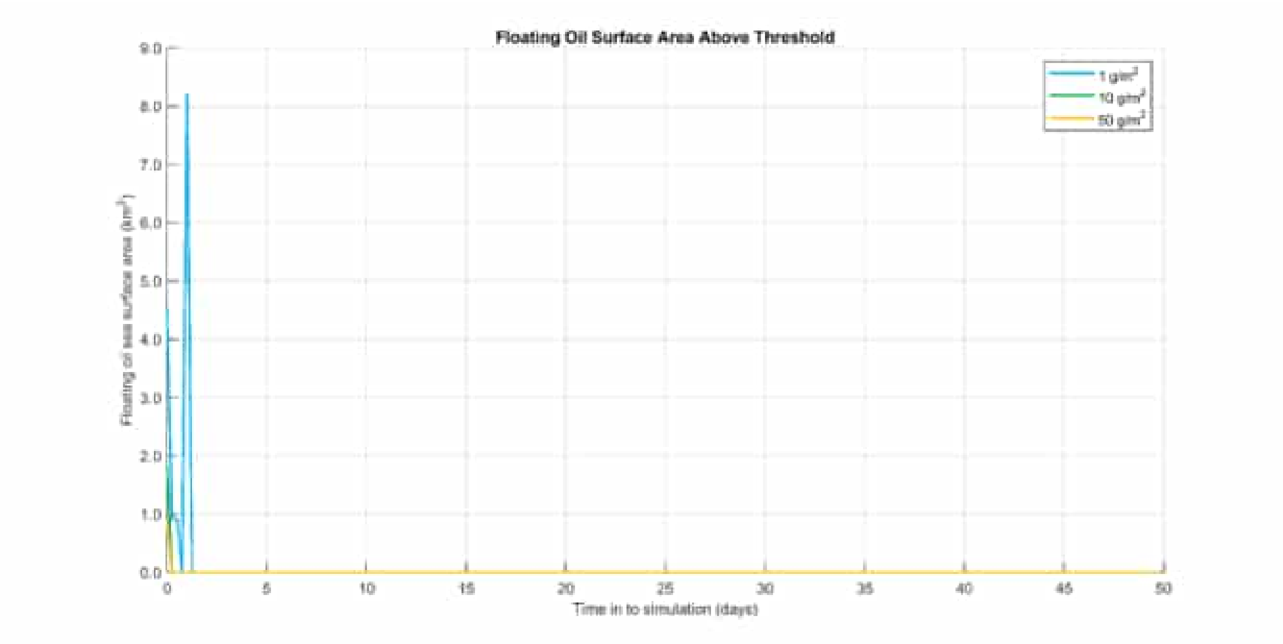


Figure 11.26 Predicted area of floating oil for each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 5.

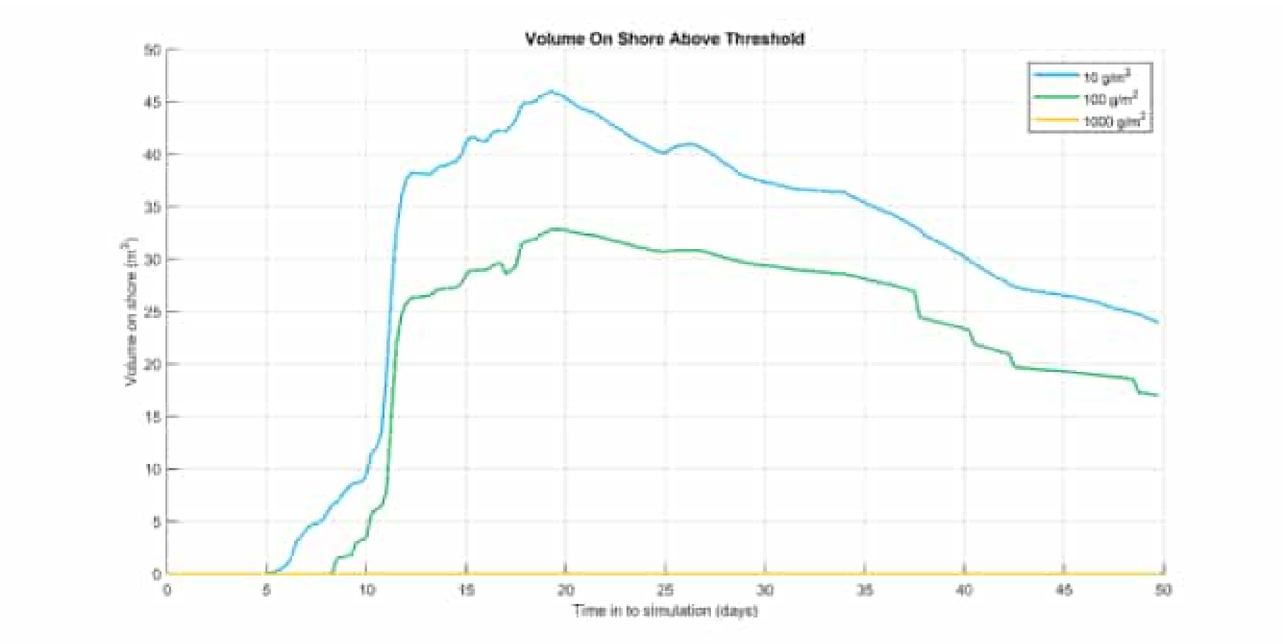


Figure 11.27 Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 5.

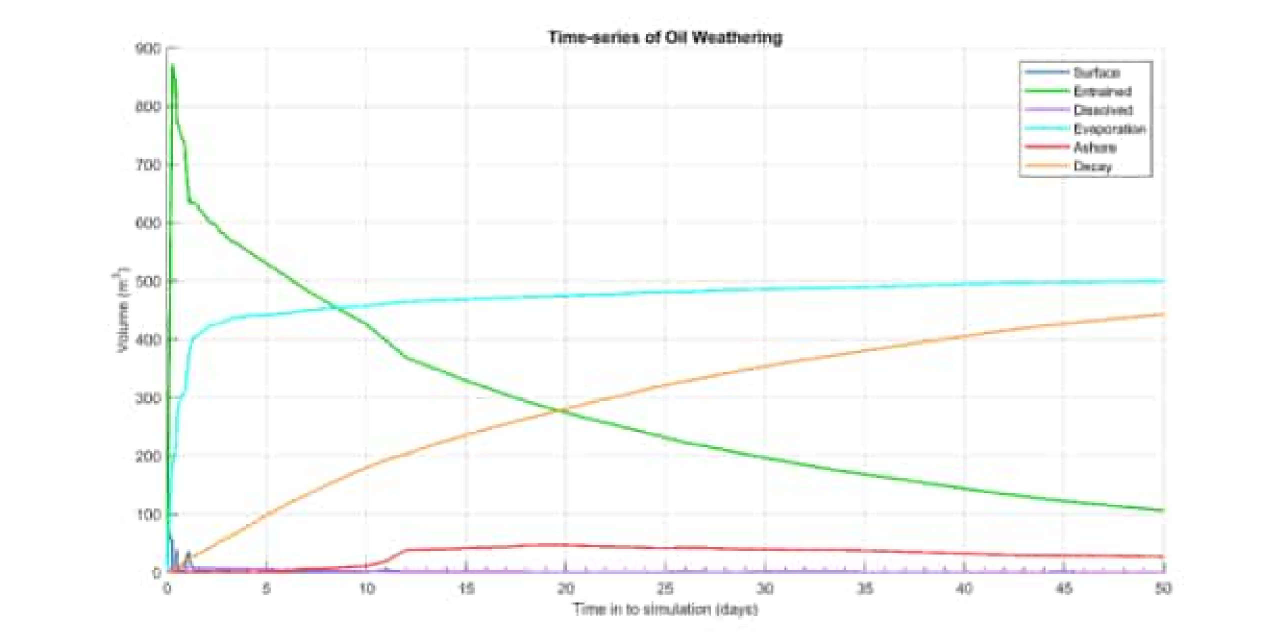


Figure 11.28 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from an MDO survey vessel tank rupture at Location 5.

11.3.6 Maximum swept area above low threshold

The simulation that resulted in the maximum swept area above the low threshold of 1 g/m^2 from all 500 spill simulations (i.e. 100 simulations per five selected locations) was identified from Location 4 as run number 86, which commenced at 1 pm 14th May 2010.

Figure 11.29 shows screenshots of the predicted floating oil exposure on day 1, 2, 3 and 4 for the simulation.

Figure 11.30 presents the extent of the predicted floating oil exposure zones on the sea surface (swept area) and the shoreline loading over the entire simulation (50 days).

Figure 11.31 presents the area of floating oil over time for each threshold during the 50 day simulation. The floating oil exposure dropped below the moderate and high thresholds after 2.5 days from the commencement of the spill, whilst the exposure dropped below the low threshold before day-4.

Figure 11.32 presents the maximum volume ashore for each threshold.

Figure 11.33 presents the fates and weathering for the corresponding simulation. At the conclusion of the simulation (day-50), approximately 673 m^3 (63%) evaporated, 291 m^3 (27%) decayed, <0 m^3 (<1%) remained on the surface and 108 m^3 (10%) was entrained within the water column. Additionally, 3 m^3 (<1%) remained on the shorelines.

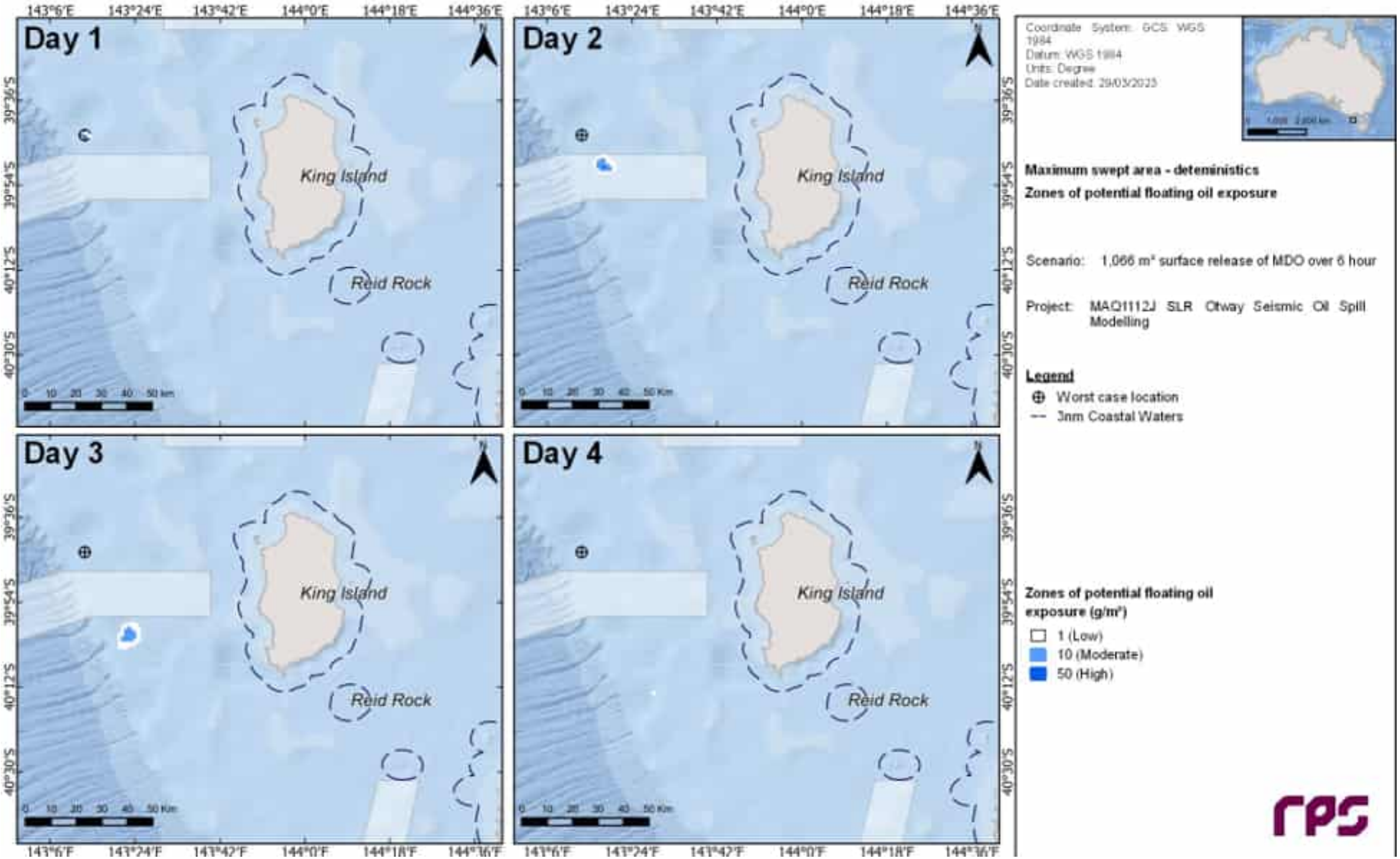


Figure 11.29 Predicted floating oil exposure at day 1, 2, 3 and 4 for the simulation that led to the maximum swept area of floating oil above 1 g/m² from all 500 simulations in the event of an MDO survey vessel tank rupture.

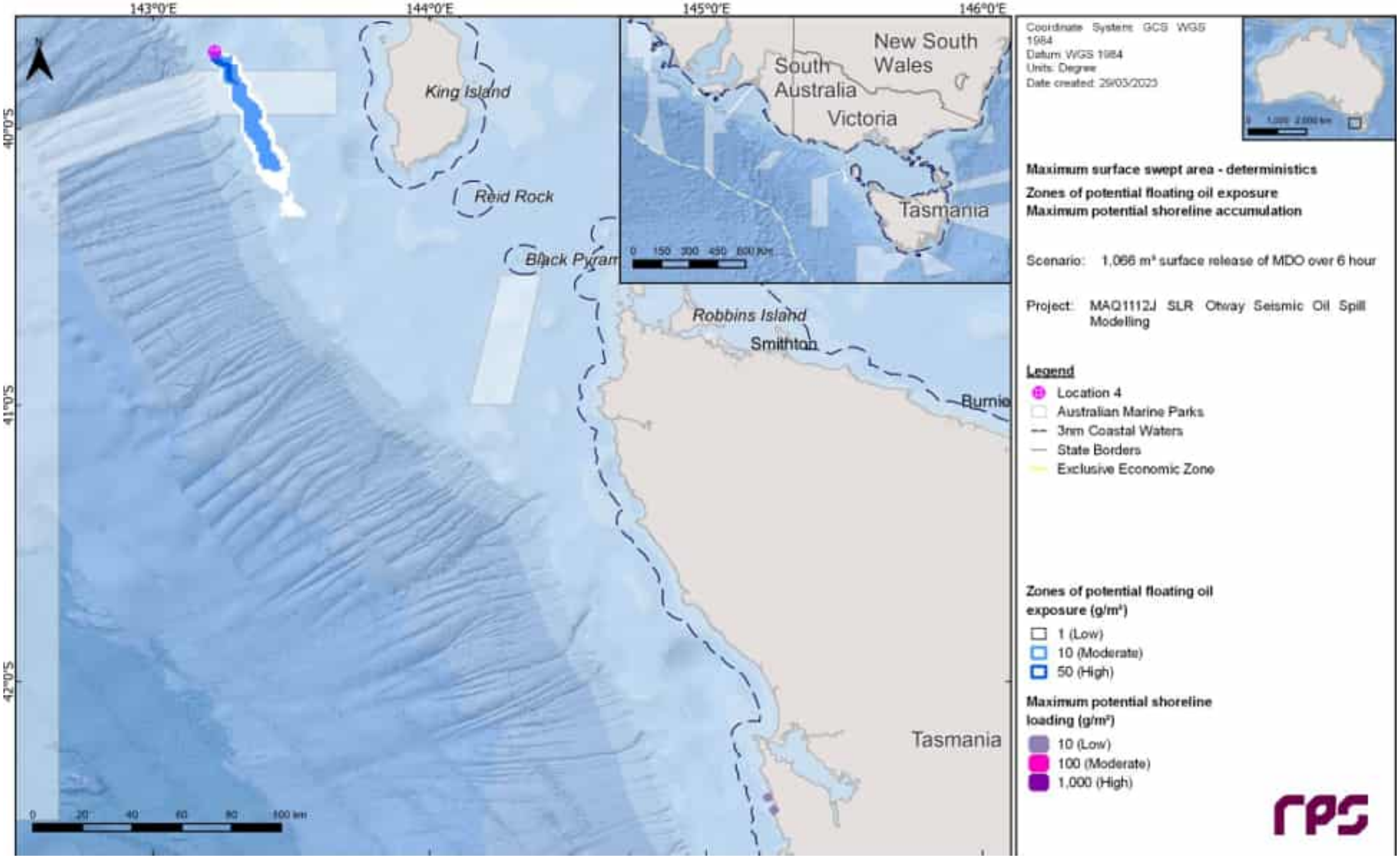


Figure 11.30 Predicted extent of the floating oil exposure and shoreline loading over the entire 50 days for the simulation that led to the maximum swept area of floating oil above 1 g/m² from all 500 simulations in the event of an MDO survey vessel tank rupture.

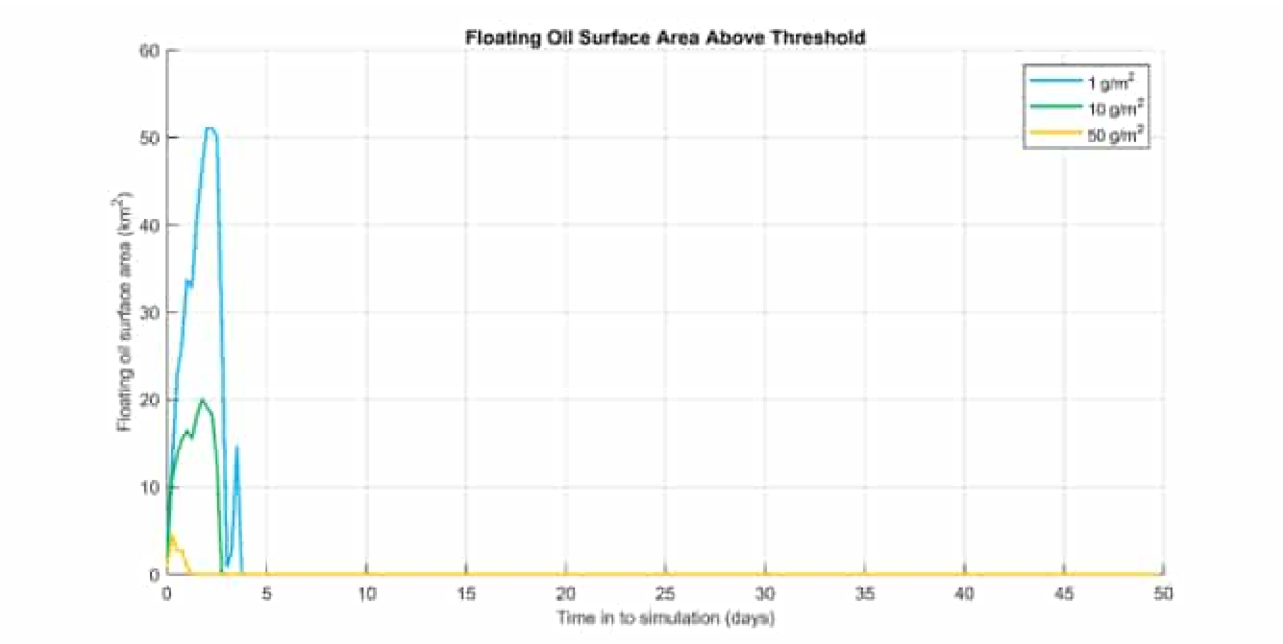


Figure 11.31 Predicted area of floating oil for each threshold for the simulation that led to the maximum swept area of floating oil above 1 g/m^2 from all 500 simulations in the event of an MDO survey vessel tank rupture.

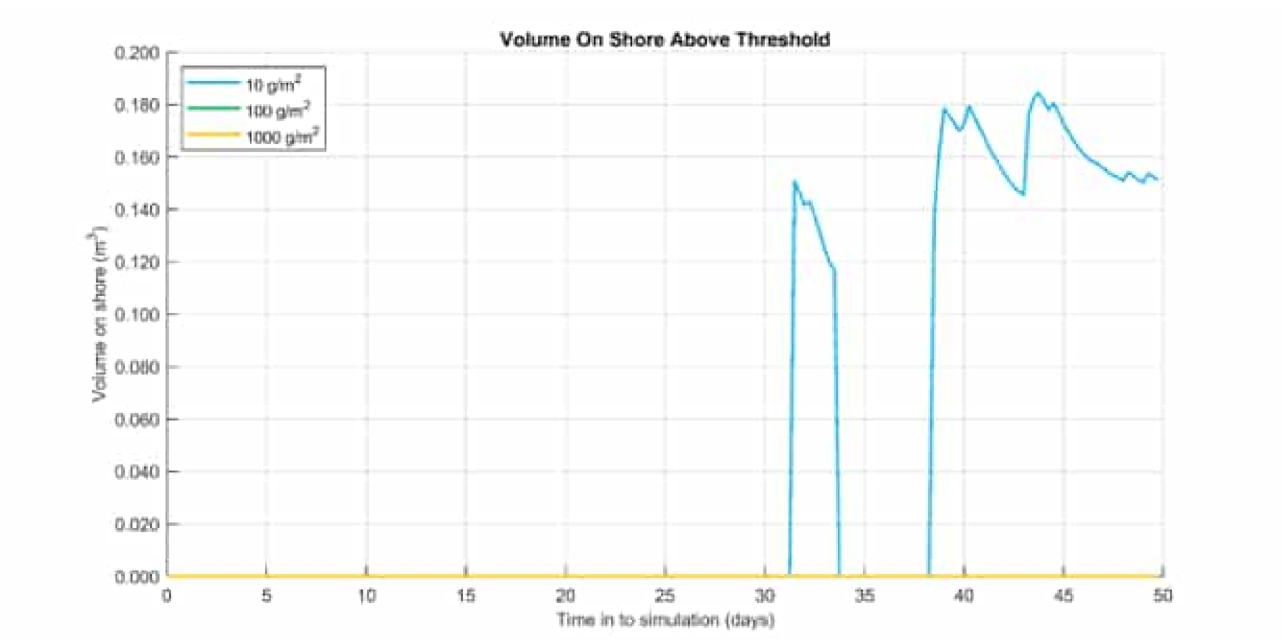


Figure 11.32 Predicted volume of oil accumulating on shorelines at each threshold for the simulation that led to the maximum swept area of floating oil above 1 g/m^2 from all 500 simulations in the event of an MDO survey vessel tank rupture.

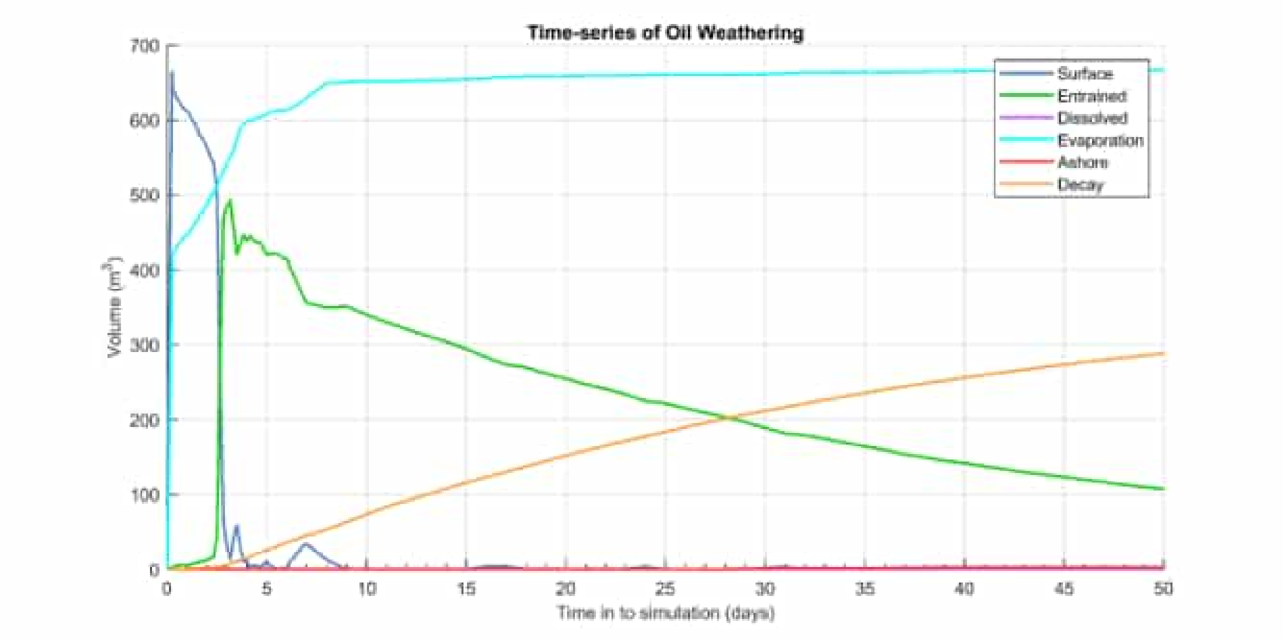


Figure 11.33 Predicted weathering and fates for the simulation that resulted in the maximum volume of oil ashore for the simulation that led to the maximum volume of oil ashore from all 500 simulations in the event of an MDO survey vessel tank rupture.

12 REFERENCES

American Society for Testing and Materials (ASTM) 2013. F2067-13 Standard Practice for Development and Use of Oil-Spill Trajectory Models, ASTM International, West Conshohocken (PA).

Andersen, OB 1995, 'Global ocean tides from ERS 1 and TOPEX/POSEIDON altimetry', *Journal of Geophysical Research: Oceans*, vol. 100, no. C12, pp. 25249–25259.

Anderson JW, Neff JM, Cox BA, Tatem HE & Hightower GM 1974, 'Characteristics of dispersions and water-soluble extracts of crude and refined oils and their toxicity to estuarine crustaceans and fish', *Marine Biology*, vol. 27, no. 1, pp. 75–88.

Anderson JW, Riley R, Kiesser S & Gurtisen J 1987, 'Toxicity of dispersed and undispersed Prudhoe Bay crude oil fractions to shrimp and fish', *Proceedings of the 1987 International Oil Spill Conference*, American Petroleum Institute, pp. 235–240.

Australian Maritime Safety Authority (AMSA) 2014, 'Identification of oil on water: Aerial observations and identification guide', viewed 4 June 2020, https://www.amsa.gov.au/sites/default/files/2014-01-mp-amsa22-identification-oil-on-water.pdf

Australian Maritime Safety Authority (AMSA) 2015, 'Australian Maritime Safety Authority Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities Australian Maritime Safety Authority', viewed 20 June 2017, https://www.amsa.gov.au/forms-and-publications/Publications/AMSA413_Contingency_Planning_Guidelines.pdf

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The guidelines (National water quality management strategy; no.4). Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

Becker, JJ, Sandwell, DT, Smith, WHF, Braud, J, Binder, B, Depner, J, Fabre, D, Factor, J, Ingalls, S, Kim, S-H, Ladner, R, Marks, K, Nelson, S, Pharaoh, A, Trimmer, R, Von Rosenberg, J, Wallace, G & Weatherall, P 2009, 'Global bathymetry and evaluation data at 30 arc seconds resolution: SRTM30_PLUS', *Marine Geodesy*, vol. 32, no. 4, pp. 355–371.

Blum DJ & Speece RE 1990, 'Determining chemical toxicity to aquatic species', *Environmental Science & Technology*, vol. 24, no. 3, pp. 284–293.

Bobra, M 1991, 'Water-in-oil emulsification: a physicochemical study', *Proceedings of the International Oil Spill Conference*, American Petroleum Institute, pp. 483–488.

Bonn Agreement 2009, Bonn Agreement aerial operations handbook, 2009 - Publication of the Bonn Agreement, London, viewed 13 January 2015, http://www.bonnagreement.org/site/assets/files/3947/ba-aoh_revision_2_april_2012.pdf

Carls MG, Holland L, Larsen M, Collier TK, Scholz NL & Incardona JP 2008, 'Fish embryos are damaged by dissolved PAHs, not oil particles', *Aquatic Toxicology*, vol. 88, no. 2, pp.121–127.

Chassignet, EP, Hurlburt, HE, Smedstad, OM, Halliwell, GR, Hogan, PJ, Wallcraft, AJ, Baraille, R & Bleck, R 2007, 'The HYCOM (hybrid coordinate ocean model) data assimilative system', *Journal of Marine Systems,* vol. 65, no. 1, pp. 60–83.

Chassignet, E, Hurlburt, H, Metzger, E, Smedstad, O, Cummings, J & Halliwell, G 2009, 'U.S. GODAE: Global Ocean Prediction with the HYbrid Coordinate Ocean Model (HYCOM)', *Oceanography*, vol. 22, no. 2, pp. 64–75.

Daling, PS & Brandvik, PJ 1991, 'Characterization and prediction of the weathering properties of oils at sea-a manual for the oils investigated in the DIWO project (No. IKU-R--02.0786. 00/16/91)', Institutt for Kontinentalundersoekelser og Petroleumsteknologi A/S.

Daling, PS, Aamo, OM, Lewis, A. & Strøm-Kristiansen, T 1997, 'SINTEF/IKU Oil-Weathering Model: Predicting Oils' Properties At Sea', *Proceedings of the International Oil spill conference*, American Petroleum Institute, pp. 297–307.

Davies, AM 1977a, 'The numerical solutions of the three-dimensional hydrodynamic equations using a B-spline representation of the vertical current profile', in JC Nihoul (ed), Bottom Turbulence: *Proceedings of the 8th Liège Colloquium on Ocean Hydrodynamics,* Elsevier Scientific, Amsterdam, pp. 1–25.

Davies, AM 1977b, 'Three-dimensional model with depth-varying eddy viscosity', in JC Nihoul (ed), Bottom Turbulence: *Proceedings of the 8th Liège Colloquium on Ocean Hydrodynamics,* Elsevier Scientific, Amsterdam, pp. 27–48.

Delvigne, GA 1991, 'On scale modeling of oil droplet formation from spilled oil', *Proceedings of the International Oil Spill Conference*, American Petroleum Institute, pp. 501–506.

Delvigne, GAL & Sweeney, C 1988, 'Natural dispersion of oil', *Oil and Chemical Pollution*, vol. 4, no. 4, pp.281–310.

Fingas, MF 1995, 'A literature review of the physics and predictive modelling of oil spill evaporation', *Journal of Hazardous Materials*, vol. 42, no. 2, pp.157–175.

Fingas, MF 1997, 'Studies on the evaporation of crude oil and petroleum products: I. The relationship between evaporation rate and time', *Journal of Hazardous Materials*, vol. 56, no. 3, pp.227–236.French, D, Reed, M, Jayko, K, Feng, S, Rines, H, Pavignano, S, Isaji, T, Puckett, S, Keller, A, French III, FW, Gifford, D, McCue, J, Brown, G, MacDonald, E, Quirk, J, Natzke, S, Bishop, R, Welsh, M, Phillips, M, Ingram, BS 1996, *The CERCLA Type A natural resource damage assessment model for coastal and marine environments (NRDAM/CME), Technical Documentation, Volume I - Model Description, Final Report*, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Washington DC.

French, D, Schuttenberg, H & Isaji, T 1999, 'Probabilities of oil exceeding thresholds of concern: examples from an evaluation for Florida Power and Light', *Proceedings of the 22nd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar,* Environment Canada, Alberta, pp. 243–270.

French-McCay, DP 2002, 'Development and application of an oil toxicity and exposure model, OilToxEx', *Environmental Toxicology and Chemistry*, vol. 21, no. 10, pp. 2080-2094.

French-McCay, DP 2003, 'Development and application of damage assessment modelling: example assessment for the North Cape oil spill', *Marine Pollution Bulletin*, *vol.* 47, no. 9, pp. 9–12.

French-McCay, DP 2004, ‘Spill impact modelling: development and validation’, *Environmental Toxicology and Chemistry, vol.* 23, no.10, pp. 2441–2456.

French-McCay, DP 2009, ‘State-of-the-art and research needs for oil spill impact assessment modelling’, *Proceedings of the 32nd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar*, Environment Canada, Ottawa, pp. 601–653.

French-McCay, D, Rowe, JJ, Whittier, N, Sankaranarayanan, S, & Etkin, DS 2004, ‘Estimate of potential impacts and natural resource damages of oil’, *Journal of Hazardous Materials*, vol. 107, no. 1, pp. 11–25.

French-McCay, D, Whittier, N, Dalton, C, Rowe, J, Sankaranarayanan, S & Aurand, D 2005a, ‘Modeling the fates of hypothetical oil spills in Delaware, Florida, Texas, California, and Alaska waters, varying response options including use of dispersants’, *Proceedings of the International Oil Spill Conference 2005*, American Petroleum Institute, Washington DC, paper 399.

French-McCay, D, Whittier, N, Rowe, J, Sankaranarayanan, S, Kim, H-S & Aurand, D 2005b, ‘Use of probabilistic trajectory and impact modeling to assess consequences of oil spills with various response strategies,’ *Proceedings of the 28th Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Environment Canada*, Ottawa, pp. 253–271.

French-McCay, DP 2009, ‘State-of-the-art and research needs for oil spill impact assessment modelling’, *Proceedings of the 32nd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar*, Environment Canada, Ottawa, pp. 601–653.

French-McCay, D, Rowe, JJ, Whittier, N, Sankaranarayanan, S, & Etkin, DS 2004, ‘Estimate of potential impacts and natural resource damages of oil’, *Journal of Hazardous Materials*, vol. 107, no. 1, pp. 11–25.

French-McCay, D, Reich, D, Rowe, J, Schroeder, M & Graham, E 2011, ‘Oil spill modeling input to the offshore environmental cost model (OECM) for US-BOEMRE's spill risk and costs evaluations’, *Proceedings of the 34th Arctic and Marine Oil Spill Program (AMOP) Technical Siminar, Environment Canada,* Ottawa.

French-McCay, D, Reich, D, Michel, J, Etkin, DS, Symons, L, Helton, D, & Wagner J 2012, ‘Oil spill consequence analysis of potentially-polluting shipwrecks’, *Proceedings of the 35th Arctic and Marine Oil Spill Program (AMOP) Technical Seminar*, Environment Canada, Ottawa.

French-McCay, D, Jayko, K, Li, Z, Horn, M, Kim, Y, Isaji, T, Crowley, D, Spaulding, M, Decker, L, Turner, C, Zamorski, S, Fontenault, J, Schmmkler, R & Rowe, J 2015, ’Technical Reports for Deepwater Horizon Water Column Injury Assessment: WC_TR.14: Modeling Oil Fate and Exposure Concentrations in the Deepwater Plume and Rising Oil Resulting from the Deepwater Horizon Oil Spill’ RPS ASA, South Kingston, Rhode Island.

Fu, R, Del Genio, AD & Rossow, WB 1994, ‘Influence of ocean surface conditions on atmospheric vertical thermodynamic structure and deep convection’. *Journal of Climate*, vol.7, no. 7, pp. 1092–1108.

Gordon, R 1982, ‘Wind driven circulation in Narragansett Bay’ PhD thesis, Department of Ocean Engineering, University of Rhode Island.

Grant, DL, Clarke, PJ & Allaway, WG 1993, 'The response of grey mangrove (*Avicennia marina* (Forsk.) Vierh) seedlings to spills of crude oil,' *The Journal of Experimental Marine Biological Ecology*, *vol.* 171, no. 2, pp. 273–295.

Isaji, T & Spaulding, M 1984, 'A model of the tidally induced residual circulation in the Gulf of Maine and Georges Bank', *Journal of Physical Oceanography*, vol. 14, no. 6, pp. 1119–1126.

Isaji, T, Howlett, E, Dalton C, & Anderson, E 2001, 'Stepwise-continuous-variable-rectangular grid hydrodynamics model', *Proceedings of the 24th Arctic and Marine Oil spill Program (AMOP) Technical Seminar (including 18th TSOCS and 3rd PHYTO)*, Environment Canada, Edmonton, pp. 597–610.

Jones, ISF 1980, 'Tidal and wind driven currents in Bass Strait', *Australian Journal of Marine and Freshwater Research* vol. 31, no. 2, pp. 109–117.

King, BA & McAllister, FA 1998, 'Modelling the dispersion of produced water discharges', *The APPEA Journal*, vol. *38*, no. 1, pp.681–691.

Koops, W, Jak, RG & van der Veen, DPC 2004, 'Use of dispersants in oil spill response to minimise environmental damage to birds and aquatic organisms', *Proceedings of the Interspill 2004: Conference and Exhibition on Oil Spill Technology,* Trondheim, presentation 429.

Kostianoy, AG, Ginzburg, AI, Lebedev, SA, Frankignoulle, M & Delille, B 2003, 'Fronts and mesoscale variability in the southern Indian Ocean as inferred from the TOPEX/POSEIDON and ERS-2 Altimetry data', *Oceanology*, vol. 43, no. 5, pp. 632–642.

Levitus, S, Antonov, JI, Baranova, OK, Boyer, TP, Coleman, CL, Garcia, HE, Grodsky, AI, Johnson, DR, Locarnini, RA, Mishonov, AV, Reagan, JR, Sazama, CL, Seidov, D, Smolyar, I, Yarosh, ES & Zweng, MM 2013, 'The World Ocean Database', *Data Science Journal*, vol.12, no. 0, pp. WDS229–WDS234.

Lin, Q & Mendelssohn, IA 1996, 'A comparative investigation of the effects of south Louisiana crude oil on the vegetation of fresh, brackish and Salt Marshes', *Marine Pollution Bulletin*, vol. 32, no. 2, pp. 202–209.

Ludicone, D, Santoleri, R, Marullo, S & Gerosa, P 1998, 'Sea level variability and surface eddy statistics in the Mediterranean Sea from TOPEX/POSEIDON data. *Journal of Geophysical Research*, vol. 103, no. C2, pp. 2995–3011.

Mackay, D & Southwood, JM 1992 'Modelling the fate of organochlorine chemicals in pulp mill effluents', *Water Quality Research Journal*, vol. 27, no. 3, pp.509–538.

Malins DC & Hodgins HO 1981, 'Petroleum and marine fishes: a review of uptake, disposition, and effects', *Environmental Science & Technology*, vol. 15, no. 11, pp.1272–1280.

Matsumoto, K, Takanezawa, T & Ooe, M 2000, 'Ocean tide models developed by assimilating TOPEX/POSEIDON altimeter data into hydrodynamical model: A global model and a regional model around Japan', *Journal of Oceanography*, vol. 56, no.5, pp. 567–581.

McAuliffe CD 1987, ‘Organism exposure to volatile/soluble hydrocarbons from crude oil spills – a field and laboratory comparison’, *Proceedings of the 1987 International Oil Spill Conference*, American Petroleum Institute, pp. 275–288.

McCarty LS 1986, ‘The relationship between aquatic toxicity QSARs and bioconcentration for some organic chemicals’, *Environmental Toxicology and Chemistry*, vol. 5, no. 12, pp. 1071–1080.

McCarty LS, Dixon DG, MacKay D, Smith AD & Ozburn GW 1992a, ‘Residue-based interpretation of toxicity and bioconcentration QSARs from aquatic bioassays: Neutral narcotic organics’, *Environmental Toxicology and Chemistry*, vol. 11, no. 7, pp.917–930.

McCarty LP, Flannagan DC, Randall SA & Johnson KA 1992b, ‘Acute toxicity in rats of chlorinated hydrocarbons given via the intratracheal route’, *Human & Experimental Toxicology*, vol. 11, no. 3, pp.173–117.

McCarty LS & Mackay D 1993, ‘Enhancing ecotoxicological modelling and assessment. Body residues and modes of toxic action’, *Environmental Science & Technology*, vol. 27, no. 9, pp. 1718–1728.

McGrath JA, & Di Toro DM 2009, ‘Validation of the target lipid model for toxicity assessment of residual petroleum constituents: monocyclic and polycyclic aromatic hydrocarbons, *Environmental Toxicology and Chemistry*, vol. 28, no. 6, pp. 1130–1148.

National Aeronautics and Space Administration (NASA). 2013a. National Aeronautics and Space Administration/Jet Propulsion Laboratory TOPEX/Poseidon Fact Sheet. NASA. Available at: https://sealevel.jpl.nasa.gov/missions/topex/topexfactsheet (accessed 23 November 2013).

National Aeronautics and Space Administration (NASA). 2013b. National Aeronautics and Space Administration/Jet Propulsion Laboratory TOPEX/Poseidon. NASA. Available at: https://sealevel.jpl.nasa.gov/missions/topex (accessed 23 November 2013).

National Oceanic and Atmospheric Administration (NOAA) 2013, Screening level risk assessment package Gulf state, Office of National Marine Sanctuaries & Office of Response and Restoration, Washington DC.

National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) 2018, ‘At a glance: Oil spill modelling’, viewed 15 November 2018, https://www.nopsema.gov.au/assets/Publications/A626200.pdf

National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) 2019, ‘NOPSEMA Bulletin #1: Oil spill modelling’, viewed April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf

National Research Council (NRC) 2003, ‘Oil in the sea III: Inputs, fates and effects’, The National Academic Press, Washington D.C.

National Research Council (NRC) 2005, ‘Oil Spill Dispersants Efficacy and Effects. Committee on Oil Spill Dispersants: Efficacy and Effects’, National Research Council, The National Academies Press, Washington DC.

Neff, JM, & Anderson, JW 1981, 'Response of marine animals to petroleum and specific petroleum hydrocarbons', Applied Science Publishers, London.

Nirmalakhandan N & Speece RE 1998, 'Quantitative techniques for predicting the behaviour of chemicals in the ecosystem', *Environmental Science & Technology*, vol. 22, no. 6, pp. 606–615.

Nordtug T, Olsen AJ, Altin D, Overrein I, Storøy W, Hansen BH & De Laender F 2011, 'Oil droplets do not affect assimilation and survival probability of first feeding larvae of North-East Arctic cod', *Science of the Total Environment*, vol. 412, pp.148–153.

Oil Spill Solutions 2015, *Evaluation - The Theory of Oil Slick Appearances*, viewed 6 January 2015, http://www.oilspillsolutions.org/evaluation.htm

Owen, A 1980, 'A three-dimensional model of the Bristol Channel', *Journal of Physical Oceanography*, vol. 10, pp. 1290–1302.

Okubo, A 1971, 'Oceanic diffusion diagrams', *Deep Sea Research and Oceanographic Abstracts, v*ol. 18, no. 8, pp. 789–802.

Qiu, B & Chen, S 2010, 'Eddy-mean flow interaction in the decadally modulating Kuroshio Extension system', *Deep-Sea Research II*, vol. 57, no. 13, pp. 1098–1110.

Redman AD 2015, 'Role of entrained droplet oil on the bioavailability of petroleum substances in aqueous exposures', *Marine Pollution Bulletin*, vol. 97, no. (1-2), pp. 342–348.

Saha, S, Moorthi, S, Pan, H-L, Wu, X, Wang, J & Nadiga, S 2010, 'The NCEP Climate Forecast System Reanalysis', *Bulletin of the American Meteorological Society*, vol. 91, no. 8, pp. 1015–1057.

Sandery, P & Kanpf, J 2007, 'Transport timescales for identifying seasonal variation in Bass Strait, south-eastern Australia', *Estuarine, Coastal and Shelf Science*, vol. 74, no. 4, pp. 684-696.

Scholten, MCTh, Kaag, NHBM, Dokkum, HP van, Jak, R.G., Schobben, HPM & Slob, W 1996, *Toxische effecten van olie in het aquatische milieu*, TNO report TNO-MEP – R96/230, Den Helder.

Suprayogi, B & Murray, F 1999, 'A field experiment of the physical and chemical effects of two oils on mangroves', *Environmental and Experimental Botany*, vol. 42, no. 3, pp. 221–229.

Swartz RC, Schults DW, Ozretich RJ, Lamberson JO, Cole FA, Ferraro SP, Dewitt TH & Redmond MS 1995, 'ΣPAH: A Model to predict the toxicity of polynuclear aromatic hydrocarbon mixtures in field-collected sediments', *Environmental Toxicology and Chemistry*, vol. 14, no. 11, pp. 1977–1187.

Verhaar, H.J., Van Leeuwen, C.J. and Hermens, J.L., 1992. Classifying environmental pollutants. *Chemosphere*, vol. 25, no. 4, pp.471–491.

Verhaar, H.J., de Wolf, W., Dyer, S., Legierse, K.C., Seinen, W. and Hermens, J.L., 1999. An LC50 vs time model for the aquatic toxicity of reactive and receptor-mediated compounds. Consequences for bioconcentration kinetics and risk assessment. *Environmental science & technology*, vol. 33, no. 5, pp.758–763.

Yaremchuk, M & Tangdong, Q 2004, ‘Seasonal variability of the large-scale currents near the coast of the Philippines’, *Journal of Physical Oceanography*, *vol.* 34, no., 4, pp. 844–855.

Zigic, S, Zapata, M, Isaji, T, King, B, & Lemckert, C 2003, ‘Modelling of Moreton Bay using an ocean/coastal circulation model’, Proceedings of the 16th Australasian Coastal and Ocean Engineering Conference, the 9th Australasian Port and Harbour Conference and the Annual New Zealand Coastal Society Conference, Institution of Engineers Australia, Auckland, paper 170.

Addendum 1 to – Oil Spill Trajectory Modelling Report – BIA Exposure

Release location 1 - Surface Exposure							
Receptor Category	Receptor	Probability of low floating oil exposure ($1g/m^2$)	Probability of moderate floating oil exposure ($10g/m^2$)	Probability of high floating oil exposure ($50g/m^2$)	Minimum time before low ($1g/m^2$) floating oil exposure (days)	Minimum time before moderate ($10g/m^2$) floating oil exposure (days)	Minimum time before high ($50g/m^2$) floating oil exposure (days)
BIA	Antipodean Albatross - Foraging	100	.	64	0.04	0.04	0.04
BIA	Australasian Gannet - Foraging	16	-	-	1.17	-	-
BIA	Black-browed Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Black-faced Cormorant - Foraging	-	-	-	-	-	-
BIA	Bullers Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Campbell Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Common Diving-petrel - Foraging	100	100	64	0.04	0.04	0.04
BIA	Indian Yellow-nosed Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Little Penguin - Foraging	-	-	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	100	100	64	0.04	0.04	0.04
BIA	Pygmy Blue Whale - Foraging	100	100	64	0.04	0.04	0.04
BIA	Short-tailed Shearwater - Breeding	-	-	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	2	-	-	6.21	-	-
BIA	Shy Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-	-	-
BIA	Southern Right Whale - Aggregation	12	-	-	1.67	-	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-	-	-
BIA	Southern Right Whale - Migration	58	8	2	0.13	0.17	0.5
BIA	Wandering Albatross - Foraging	100	100	64	0.04	0.04	0.04
BIA	Wedge-tailed Shearwater - Foraging	15	-	-	1.58	-	-
BIA	White Shark - Distribution	100	100	64	0.04	0.04	0.04
BIA	White Shark - Foraging	6	-	-	2.17	-	-
BIA	White-faced Storm-petrel - Foraging	-	-	-	-	-	-

Release location 2 - Surface Exposure							
Receptor Category	Receptor	Probability of low floating oil exposure ($1g/m^2$)	Probability of moderate floating oil exposure ($10g/m^2$)	Probability of high floating oil exposure ($50g/m^2$)	Minimum time before low ($1g/m^2$) floating oil exposure (days)	Minimum time before moderate ($10g/m^2$) floating oil exposure (days)	Minimum time before high ($50g/m^2$) floating oil exposure (days)
BIA	Antipodean Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Australasian Gannet - Foraging	100	100	60	0.04	0.04	0.04
BIA	Black-browed Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Black-faced Cormorant - Foraging	-	-	-	-	-	-
BIA	Bullers Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Campbell Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Common Diving-petrel - Foraging	100	100	63	0.04	0.04	0.04
BIA	Indian Yellow-nosed Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Little Penguin - Foraging	-	-	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	100	100	63	0.04	0.04	0.04
BIA	Pygmy Blue Whale - Foraging	100	100	63	0.04	0.04	0.04
BIA	Short-tailed Shearwater - Breeding	-	-	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	3	-	-	3.63	-	-
BIA	Shy Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-	-	-
BIA	Southern Right Whale - Aggregation	10	1	-	1.17	1.21	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-	-	-
BIA	Southern Right Whale - Migration	100	100	60	0.04	0.04	0.04
BIA	Wandering Albatross - Foraging	100	100	63	0.04	0.04	0.04
BIA	Wedge-tailed Shearwater - Foraging	100	100	63	0.04	0.04	0.04
BIA	White Shark - Distribution	100	100	63	0.04	0.04	0.04
BIA	White Shark - Foraging	6	1	-	1.17	1.17	-
BIA	White-faced Storm-petrel - Foraging	-	-	-	-	-	-

Release location 3 - Surface Exposure							
Receptor Category	Receptor	Probability of low floating oil exposure (1g/m^2)	Probability of moderate floating oil exposure (10g/m^2)	Probability of high floating oil exposure (50g/m^2)	Minimum time before low (1g/m^2) floating oil exposure (days)	Minimum time before moderate (10g/m^2) floating oil exposure (days)	Minimum time before high (50g/m^2) floating oil exposure (days)
BIA	Antipodean Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Australasian Gannet - Foraging	-	-	-	-	-	-
BIA	Black-browed Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Black-faced Cormorant - Foraging	1	-	-	5.96	-	-
BIA	Bullers Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Campbell Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Common Diving-petrel - Foraging	100	100	88	0.04	0.04	0.04
BIA	Indian Yellow-nosed Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Little Penguin - Foraging	1	-	-	6.04	-	-
BIA	Pygmy Blue Whale - Distribution	100	100	88	0.04	0.04	0.04
BIA	Pygmy Blue Whale - Foraging	100	100	88	0.04	0.04	0.04
BIA	Short-tailed Shearwater - Breeding	1	-	-	5.83	-	-
BIA	Short-tailed Shearwater - Foraging	100	100	88	0.04	0.04	0.04
BIA	Shy Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-	-	-
BIA	Southern Right Whale - Aggregation	1	-	-	5.79	-	-
BIA	Southern Right Whale - Connecting Habitat	1	-	-	5.58	-	-
BIA	Southern Right Whale - Migration	100	100	88	0.04	0.04	0.04
BIA	Wandering Albatross - Foraging	100	100	88	0.04	0.04	0.04
BIA	Wedge-tailed Shearwater - Foraging	100	100	88	0.04	0.04	0.04
BIA	White Shark - Distribution	100	100	88	0.04	0.04	0.04
BIA	White Shark - Foraging	1	-	-	5.79	-	-
BIA	White-faced Storm-petrel - Foraging	5	-	-	4.13	-	-

Release location 4 - Surface Exposure							
Receptor Category	Receptor	Probability of low floating oil exposure ($1g/m^2$)	Probability of moderate floating oil exposure ($10g/m^2$)	Probability of high floating oil exposure ($50g/m^2$)	Minimum time before low ($1g/m^2$) floating oil exposure (days)	Minimum time before moderate ($10g/m^2$) floating oil exposure (days)	Minimum time before high ($50g/m^2$) floating oil exposure (days)
BIA	Antipodean Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Australasian Gannet - Foraging	-	-	-	-	-	-
BIA	Black-browed Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Black-faced Cormorant - Foraging	4	-	-	3.29	-	-
BIA	Bullers Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Campbell Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Common Diving-petrel - Foraging	100	100	70	0.04	0.04	0.04
BIA	Indian Yellow-nosed Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Little Penguin - Foraging	4	-	-	3.38	-	-
BIA	Pygmy Blue Whale - Distribution	100	100	70	0.04	0.04	0.04
BIA	Pygmy Blue Whale - Foraging	100	100	70	0.04	0.04	0.04
BIA	Short-tailed Shearwater - Breeding	-	-	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	100	100	70	0.04	0.04	0.04
BIA	Shy Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	3	-	-	6.17	-	-
BIA	Southern Right Whale - Migration	100	100	70	0.04	0.04	0.04
BIA	Wandering Albatross - Foraging	100	100	70	0.04	0.04	0.04
BIA	Wedge-tailed Shearwater - Foraging	100	100	70	0.04	0.04	0.04
BIA	White Shark - Distribution	100	100	70	0.04	0.04	0.04
BIA	White Shark - Foraging	3	-	-	4.33	-	-
BIA	White-faced Storm-petrel - Foraging	11	-	-	2.13	-	-

Release location 5 - Surface Exposure							
Receptor Category	Receptor	Probability of low floating oil exposure (1g/m^2)	Probability of moderate floating oil exposure (10g/m^2)	Probability of high floating oil exposure (50g/m^2)	Minimum time before low (1g/m^2) floating oil exposure (days)	Minimum time before moderate (10g/m^2) floating oil exposure (days)	Minimum time before high (50g/m^2) floating oil exposure (days)
BIA	Antipodean Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Australasian Gannet - Foraging	1	-	-	5.17	-	-
BIA	Black-browed Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Black-faced Cormorant - Foraging	-	-	-	-	-	-
BIA	Bullers Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Campbell Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Common Diving-petrel - Foraging	100	100	82	0.04	0.04	0.04
BIA	Indian Yellow-nosed Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Little Penguin - Foraging	-	-	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	16	-	-	1.13	-	-
BIA	Pygmy Blue Whale - Foraging	50	11	-	0.17	0.17	-
BIA	Short-tailed Shearwater - Breeding	-	-	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	100	100	82	0.04	0.04	0.04
BIA	Shy Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Soft-plumaged Petrel - Foraging	1	-	-	10.83	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	2	-	-	10.83	-	-
BIA	Southern Right Whale - Migration	18	1	-	0.96	1.25	-
BIA	Wandering Albatross - Foraging	100	100	82	0.04	0.04	0.04
BIA	Wedge-tailed Shearwater - Foraging	-	-	-	-	-	-
BIA	White Shark - Distribution	100	100	82	0.04	0.04	0.04
BIA	White Shark - Foraging	1	-	-	5.17	-	-
BIA	White-faced Storm-petrel - Foraging	100	100	82	0.04	0.04	0.04

Release location 1 - Dissolved Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (10m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	332.1	69	44	-
BIA	Australasian Gannet - Foraging	79.4	12	2	-
BIA	Black-browed Albatross - Foraging	332.1	69	44	-
BIA	Black-faced Cormorant - Foraging	-	-	-	-
BIA	Bullers Albatross - Foraging	332.1	69	44	-
BIA	Campbell Albatross - Foraging	332.1	69	44	-
BIA	Common Diving-petrel - Foraging	332.1	69	44	-
BIA	Indian Yellow-nosed Albatross - Foraging	332.1	69	44	-
BIA	Little Penguin - Foraging	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	332.1	69	44	-
BIA	Pygmy Blue Whale - Foraging	332.1	69	44	-
BIA	Short-tailed Shearwater - Breeding	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	45.2	1	-	-
BIA	Shy Albatross - Foraging	332.1	69	44	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	76.2	11	1	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-
BIA	Southern Right Whale - Migration	108.4	23	6	-
BIA	Wandering Albatross - Foraging	332.1	69	44	-
BIA	Wedge-tailed Shearwater - Foraging	78.4	9	2	-
BIA	White Shark - Distribution	332.1	69	44	-
BIA	White Shark - Foraging	66.3	8	1	-
BIA	White-faced Storm-petrel - Foraging	-	-	-	-

10-20 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (20m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	126.6	4	1	-
BIA	Australasian Gannet - Foraging	65.2	4	1	-
BIA	Black-browed Albatross - Foraging	126.6	4	1	-
BIA	Black-faced Cormorant - Foraging	-	-	-	-
BIA	Bullers Albatross - Foraging	126.6	4	1	-
BIA	Campbell Albatross - Foraging	126.6	4	1	-
BIA	Common Diving-petrel - Foraging	126.6	4	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	126.6	4	1	-
BIA	Little Penguin - Foraging	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	126.6	4	1	-
BIA	Pygmy Blue Whale - Foraging	126.6	4	1	-
BIA	Short-tailed Shearwater - Foraging	17.5	1	-	-
BIA	Shy Albatross - Foraging	126.6	4	1	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	81.4	4	1	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-
BIA	Southern Right Whale - Migration	81.4	4	1	-
BIA	Wandering Albatross - Foraging	126.6	4	1	-
BIA	Wedge-tailed Shearwater - Foraging	81.4	3	1	-
BIA	White Shark - Distribution	126.6	4	1	-
BIA	White Shark - Foraging	39.7	3	-	-
BIA	White-faced Storm-petrel - Foraging	-	-	-	-

Release location 2 - Dissolved Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (10m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	358.1	66	32	-
BIA	Australasian Gannet - Foraging	358.1	66	32	-
BIA	Black-browed Albatross - Foraging	358.1	66	32	-
BIA	Black-faced Cormorant - Foraging	-	-	-	-
BIA	Bullers Albatross - Foraging	358.1	66	32	-
BIA	Campbell Albatross - Foraging	358.1	66	32	-
BIA	Common Diving-petrel - Foraging	358.1	66	32	-
BIA	Indian Yellow-nosed Albatross - Foraging	358.1	66	32	-
BIA	Little Penguin - Foraging	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	358.1	66	32	-
BIA	Pygmy Blue Whale - Foraging	358.1	66	32	-
BIA	Short-tailed Shearwater - Breeding	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	51.4	4	1	-
BIA	Shy Albatross - Foraging	358.1	66	32	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	135.7	10	3	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-
BIA	Southern Right Whale - Migration	358.1	66	32	-
BIA	Wandering Albatross - Foraging	358.1	66	32	-
BIA	Wedge-tailed Shearwater - Foraging	358.1	66	32	-
BIA	White Shark - Distribution	358.1	66	32	-
BIA	White Shark - Foraging	76.2	7	3	-
BIA	White-faced Storm-petrel - Foraging	23.4	2	-	-

10-20 m depth layer

Receptor Ca	Receptor	Maximum dissolved hydrocarbon concentration (20m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	75.7	5	1	-
BIA	Australasian Gannet - Foraging	60.1	3	1	-
BIA	Black-browed Albatross - Foraging	75.7	5	1	-
BIA	Black-faced Cormorant - Foraging	-	-	-	-
BIA	Bullers Albatross - Foraging	75.7	5	1	-
BIA	Campbell Albatross - Foraging	75.7	5	1	-
BIA	Common Diving-petrel - Foraging	75.7	5	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	75.7	5	1	-
BIA	Little Penguin - Foraging	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	75	5	1	-
BIA	Pygmy Blue Whale - Foraging	75.7	5	1	-
BIA	Short-tailed Shearwater - Foraging	37.5	2	-	-
BIA	Shy Albatross - Foraging	75.7	5	1	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	70.6	3	1	-
BIA	Southern Right Whale - Connecting Habitat	-	-	-	-
BIA	Southern Right Whale - Migration	75	5	1	-
BIA	Wandering Albatross - Foraging	75.7	5	1	-
BIA	Wedge-tailed Shearwater - Foraging	75.7	5	1	-
BIA	White Shark - Distribution	75.7	5	1	-
BIA	White Shark - Foraging	52.8	3	1	-
BIA	White-faced Storm-petrel - Foraging	14.9	1	-	-

Release location 3 - Dissolved Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (10m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	318.2	79	42	-
BIA	Australasian Gannet - Foraging	-	-	-	-
BIA	Black-browed Albatross - Foraging	318.2	79	42	-
BIA	Black-faced Cormorant - Foraging	45.3	2	-	-
BIA	Bullers Albatross - Foraging	318.2	79	42	-
BIA	Campbell Albatross - Foraging	318.2	79	42	-
BIA	Common Diving-petrel - Foraging	318.2	79	42	-
BIA	Indian Yellow-nosed Albatross - Foraging	318.2	79	42	-
BIA	Little Penguin - Foraging	34.9	1	-	-
BIA	Pygmy Blue Whale - Distribution	318.2	79	42	-
BIA	Pygmy Blue Whale - Foraging	318.2	79	42	-
BIA	Short-tailed Shearwater - Breeding	14.2	1	-	-
BIA	Short-tailed Shearwater - Foraging	318.2	79	42	-
BIA	Shy Albatross - Foraging	318.2	79	42	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	35.3	1	-	-
BIA	Southern Right Whale - Migration	318.2	79	42	-
BIA	Wandering Albatross - Foraging	318.2	79	42	-
BIA	Wedge-tailed Shearwater - Foraging	318.2	79	42	-
BIA	White Shark - Distribution	318.2	79	42	-
BIA	White Shark - Foraging	-	-	-	-
BIA	White-faced Storm-petrel - Foraging	51.3	3	1	-

10-20 m depth layer

Receptor Ca	Receptor	Maximum dissolved hydrocarbon concentration (20m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	93.3	5	1	-
BIA	Australasian Gannet - Foraging	-	-	-	-
BIA	Black-browed Albatross - Foraging	93.3	5	1	-
BIA	Black-faced Cormorant - Foraging	10	1	-	-
BIA	Bullers Albatross - Foraging	93.3	5	1	-
BIA	Campbell Albatross - Foraging	93.3	5	1	-
BIA	Common Diving-petrel - Foraging	93.3	5	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	93.3	5	1	-
BIA	Little Penguin - Foraging	-	-	-	-
BIA	Pygmy Blue Whale - Distribution	93.3	5	1	-
BIA	Pygmy Blue Whale - Foraging	93.3	5	1	-
BIA	Short-tailed Shearwater - Foraging	93.3	5	1	-
BIA	Shy Albatross - Foraging	93.3	5	1	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	15.7	1	-	-
BIA	Southern Right Whale - Connecting Habitat	11.9	1	-	-
BIA	Southern Right Whale - Migration	93.3	5	1	-
BIA	Wandering Albatross - Foraging	93.3	5	1	-
BIA	Wedge-tailed Shearwater - Foraging	93.3	5	1	-
BIA	White Shark - Distribution	93.3	5	1	-
BIA	White Shark - Foraging	15.7	1	-	-
BIA	White-faced Storm-petrel - Foraging	35.8	3	-	-

Release location 4 - Dissolved Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (10m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	352.1	73	49	-
BIA	Australasian Gannet - Foraging	23.6	1	-	-
BIA	Black-browed Albatross - Foraging	352.1	73	49	-
BIA	Black-faced Cormorant - Foraging	62.1	5	1	-
BIA	Bullers Albatross - Foraging	352.1	73	49	-
BIA	Campbell Albatross - Foraging	352.1	73	49	-
BIA	Common Diving-petrel - Foraging	352.1	73	49	-
BIA	Indian Yellow-nosed Albatross - Foraging	352.1	73	49	-
BIA	Little Penguin - Foraging	38.1	5	-	-
BIA	Pygmy Blue Whale - Distribution	352.1	73	49	-
BIA	Pygmy Blue Whale - Foraging	352.1	73	49	-
BIA	Short-tailed Shearwater - Breeding	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	352.1	73	49	-
BIA	Shy Albatross - Foraging	352.1	73	49	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	30.1	3	-	-
BIA	Southern Right Whale - Migration	352.1	73	49	-
BIA	Wandering Albatross - Foraging	352.1	73	49	-
BIA	Wedge-tailed Shearwater - Foraging	352.1	73	49	-
BIA	White Shark - Distribution	352.1	73	49	-
BIA	White Shark - Foraging	41	4	-	-
BIA	White-faced Storm-petrel - Foraging	81.8	9	1	-

10-20 m depth layer

Receptor Ca	Receptor	Maximum dissolved hydrocarbon concentration (20m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	142.9	5	1	-
BIA	Australasian Gannet - Foraging	15.3	2	-	-
BIA	Black-browed Albatross - Foraging	142.9	5	1	-
BIA	Black-faced Cormorant - Foraging	33.5	3	-	-
BIA	Bullers Albatross - Foraging	142.9	5	1	-
BIA	Campbell Albatross - Foraging	142.9	5	1	-
BIA	Common Diving-petrel - Foraging	142.9	5	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	142.9	5	1	-
BIA	Little Penguin - Foraging	27.2	3	-	-
BIA	Pygmy Blue Whale - Distribution	142.9	5	1	-
BIA	Pygmy Blue Whale - Foraging	142.9	5	1	-
BIA	Short-tailed Shearwater - Foraging	142.9	5	1	-
BIA	Shy Albatross - Foraging	142.9	5	1	-
BIA	Soft-plumaged Petrel - Foraging	-	-	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	18.7	1	-	-
BIA	Southern Right Whale - Migration	142.9	5	1	-
BIA	Wandering Albatross - Foraging	142.9	5	1	-
BIA	Wedge-tailed Shearwater - Foraging	142.9	5	1	-
BIA	White Shark - Distribution	142.9	5	1	-
BIA	White Shark - Foraging	28.4	2	-	-
BIA	White-faced Storm-petrel - Foraging	68.8	4	1	-

Release location 5 - Dissolved Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum dissolved hydrocarbon concentration (10m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	307.3	80	36	-
BIA	Australasian Gannet - Foraging	87.4	4	1	-
BIA	Black-browed Albatross - Foraging	307.3	80	36	-
BIA	Black-faced Cormorant - Foraging	26.9	4	-	-
BIA	Bullers Albatross - Foraging	307.3	80	36	-
BIA	Campbell Albatross - Foraging	307.3	80	36	-
BIA	Common Diving-petrel - Foraging	307.3	80	36	-
BIA	Indian Yellow-nosed Albatross - Foraging	307.3	80	36	-
BIA	Little Penguin - Foraging	26.1	2	-	-
BIA	Pygmy Blue Whale - Distribution	111.4	10	3	-
BIA	Pygmy Blue Whale - Foraging	142	19	6	-
BIA	Short-tailed Shearwater - Breeding	-	-	-	-
BIA	Short-tailed Shearwater - Foraging	307.3	80	36	-
BIA	Shy Albatross - Foraging	307.3	80	36	-
BIA	Soft-plumaged Petrel - Foraging	66.6	3	1	-
BIA	Southern Right Whale - Aggregation	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	33.9	2	-	-
BIA	Southern Right Whale - Migration	111.4	11	3	-
BIA	Wandering Albatross - Foraging	307.3	80	36	-
BIA	Wedge-tailed Shearwater - Foraging	-	-	-	-
BIA	White Shark - Distribution	307.3	80	36	-
BIA	White Shark - Foraging	53.7	4	1	-
BIA	White-faced Storm-petrel - Foraging	307.3	80	36	-

10-20 m depth layer

Receptor Ca	Receptor	Maximum dissolved hydrocarbon concentration (20m)	Probability of low dissolved hydrocarbon exposure (10 ppb)	Probability of moderate dissolved hydrocarbon exposure (50 ppb)	Probability of high dissolved hydrocarbon exposure (400 ppb)
BIA	Antipodean Albatross - Foraging	98.9	5	1	-
BIA	Australasian Gannet - Foraging	30.4	2	-	-
BIA	Black-browed Albatross - Foraging	98.9	5	1	-
BIA	Black-faced Cormorant - Foraging	19.3	1	-	-
BIA	Bullers Albatross - Foraging	98.9	5	1	-
BIA	Campbell Albatross - Foraging	98.9	5	1	-
BIA	Common Diving-petrel - Foraging	98.9	5	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	98.9	5	1	-
BIA	Little Penguin - Foraging	21.1	2	-	-
BIA	Pygmy Blue Whale - Distribution	88.7	4	1	-
BIA	Pygmy Blue Whale - Foraging	88.7	5	1	-
BIA	Short-tailed Shearwater - Foraging	98.9	5	1	-
BIA	Shy Albatross - Foraging	98.9	5	1	-
BIA	Soft-plumaged Petrel - Foraging	30.8	2	-	-
BIA	Southern Right Whale - Aggregation	-	-	-	-
BIA	Southern Right Whale - Connecting Habitat	32.7	1	-	-
BIA	Southern Right Whale - Migration	88.7	4	1	-
BIA	Wandering Albatross - Foraging	98.9	5	1	-
BIA	Wedge-tailed Shearwater - Foraging	-	-	-	-
BIA	White Shark - Distribution	98.9	5	1	-
BIA	White Shark - Foraging	30.4	2	-	-
BIA	White-faced Storm-petrel - Foraging	98.9	5	1	-

Release location 1 - Entrained Exposure									
0-10 m depth layer					10-20 m depth layer				
Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (10m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)	Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (20m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	27,287.50	91	83	BIA	Antipodean Albatross - Foraging	18.3	1	-
BIA	Australasian Gannet - Foraging	2,029.40	48	35	BIA	Australasian Gannet - Foraging	18.3	1	-
BIA	Australian Sea Lion - Foraging	106.4	6	1	BIA	Black-browed Albatross - Foraging	18.3	1	-
BIA	Black Petrel - Foraging	10.9	1	-	BIA	Black-faced Cormorant - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	27,287.50	91	83	BIA	Bullers Albatross - Foraging	18.3	1	-
BIA	Black-faced Cormorant - Foraging	47.7	11	-	BIA	Campbell Albatross - Foraging	18.3	1	-
BIA	Bullers Albatross - Foraging	27,287.50	91	83	BIA	Common Diving-petrel - Foraging	18.3	1	-
BIA	Campbell Albatross - Foraging	27,287.50	91	83	BIA	Indian Yellow-nosed Albatross - Foraging	18.3	1	-
BIA	Common Diving-petrel - Foraging	27,287.50	91	83	BIA	Little Penguin - Foraging	-	-	-
BIA	Flesh-footed Shearwater - Foraging	10.9	1	-	BIA	Pygmy Blue Whale - Distribution	18.3	1	-
BIA	Great-winged Petrel - Foraging	-	-	-	BIA	Pygmy Blue Whale - Foraging	18.3	1	-
BIA	Grey Nurse Shark - Foraging	11.6	2	-	BIA	Short-tailed Shearwater - Foraging	-	-	-
BIA	Grey Nurse Shark - Migration	24.3	2	-	BIA	Shy Albatross - Foraging	18.3	1	-
BIA	Humpback Whale - Foraging	24.3	2	-	BIA	Southern Right Whale - Aggregation	12.2	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	27,287.50	91	83	BIA	Southern Right Whale - Migration	18.3	1	-
BIA	Indo-Pacific/Spotted Bottlenose Dolphin - Breeding	10.9	1	-	BIA	Wandering Albatross - Foraging	18.3	1	-
BIA	Little Penguin - Breeding	10.9	1	-	BIA	Wedge-tailed Shearwater - Foraging	12.2	1	-
BIA	Little Penguin - Foraging	55.9	10	-	BIA	White Shark - Distribution	18.3	1	-
BIA	Northern Giant Petrel - Foraging	-	-	-	BIA	White Shark - Foraging	12.2	1	-
BIA	Pygmy Blue Whale - Distribution	27,287.50	91	83	BIA	White-faced Storm-petrel - Foraging	-	-	-
BIA	Pygmy Blue Whale - Foraging	27,287.50	91	83					
BIA	Short-tailed Shearwater - Breeding	27.8	5	-					
BIA	Short-tailed Shearwater - Foraging	546.7	39	6					
BIA	Shy Albatross - Foraging	27,287.50	91	83					
BIA	Soft-plumaged Petrel - Foraging	34.4	2	-					
BIA	Sooty Shearwater - Foraging	24.3	2	-					
BIA	Southern Giant Petrel - Foraging	-	-	-					
BIA	Southern Right Whale - Aggregation	1,485.40	45	25					
BIA	Southern Right Whale - Breeding	-	-	-					
BIA	Southern Right Whale - Connecting Habitat	90.2	8	-					
BIA	Southern Right Whale - Migration	6,927.20	50	38					
BIA	Sperm Whale - Foraging	11.6	1	-					
BIA	Wandering Albatross - Foraging	27,287.50	91	83					
BIA	Wedge-tailed Shearwater - Foraging	1,404.20	47	28					
BIA	White Shark - Breeding	17	2	-					
BIA	White Shark - Distribution	27,287.50	91	83					
BIA	White Shark - Foraging	1,263.90	44	25					
BIA	White-capped Albatross - Foraging	-	-	-					
BIA	White-faced Storm-petrel - Breeding	22	1	-					
BIA	White-faced Storm-petrel - Foraging	301.2	33	4					
BIA	Wilsons Storm Petrel - Migration	-	-	-					

Release location 2 - Entrained Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (10m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	26,663.80	91	84
BIA	Australasian Gannet - Foraging	26,663.80	91	84
BIA	Australian Sea Lion - Foraging	32.7	3	-
BIA	Black Petrel - Foraging	11.9	1	-
BIA	Black-browed Albatross - Foraging	26,663.80	91	84
BIA	Black-faced Cormorant - Foraging	134.3	13	1
BIA	Bullers Albatross - Foraging	26,663.80	91	84
BIA	Campbell Albatross - Foraging	26,663.80	91	84
BIA	Common Diving-petrel - Foraging	26,663.80	91	84
BIA	Flesh-footed Shearwater - Foraging	11.9	1	-
BIA	Great-winged Petrel - Foraging	11.9	1	-
BIA	Grey Nurse Shark - Foraging	23.9	2	-
BIA	Grey Nurse Shark - Migration	41.1	3	-
BIA	Humpback Whale - Foraging	41.1	3	-
BIA	Indian Yellow-nosed Albatross - Foraging	26,663.80	91	84
BIA	Indo-Pacific/Spotted Bottlenose Dolphin - Breeding	15.4	1	-
BIA	Little Penguin - Breeding	72.3	8	-
BIA	Little Penguin - Foraging	129.5	12	1
BIA	Northern Giant Petrel - Foraging	11.9	1	-
BIA	Pygmy Blue Whale - Distribution	26,663.80	91	84
BIA	Pygmy Blue Whale - Foraging	26,663.80	91	84
BIA	Short-tailed Shearwater - Breeding	72.3	9	-
BIA	Short-tailed Shearwater - Foraging	850.2	38	17
BIA	Shy Albatross - Foraging	26,663.80	91	84
BIA	Soft-plumaged Petrel - Foraging	29.6	2	-
BIA	Sooty Shearwater - Foraging	41.1	3	-
BIA	Southern Giant Petrel - Foraging	11.9	1	-
BIA	Southern Right Whale - Aggregation	2,932.90	27	18
BIA	Southern Right Whale - Breeding	-	-	-
BIA	Southern Right Whale - Connecting Habitat	107.1	10	1
BIA	Southern Right Whale - Migration	26,663.80	91	84
BIA	Sperm Whale - Foraging	-	-	-
BIA	Wandering Albatross - Foraging	26,663.80	91	84
BIA	Wedge-tailed Shearwater - Foraging	26,663.80	91	84
BIA	White Shark - Breeding	18.8	3	-
BIA	White Shark - Distribution	26,663.80	91	84
BIA	White Shark - Foraging	2,932.90	24	16
BIA	White-capped Albatross - Foraging	11.9	1	-
BIA	White-faced Storm-petrel - Breeding	39.4	3	-
BIA	White-faced Storm-petrel - Foraging	544.6	31	11
BIA	Wilsons Storm Petrel - Migration	11.9	1	-

10-20 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (20m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	18	3	-
BIA	Australasian Gannet - Foraging	17.3	1	-
BIA	Black-browed Albatross - Foraging	18	3	-
BIA	Black-faced Cormorant - Foraging	-	-	-
BIA	Bullers Albatross - Foraging	18	3	-
BIA	Campbell Albatross - Foraging	18	3	-
BIA	Common Diving-petrel - Foraging	18	3	-
BIA	Indian Yellow-nosed Albatross - Foraging	18	3	-
BIA	Little Penguin - Foraging	-	-	-
BIA	Pygmy Blue Whale - Distribution	18	3	-
BIA	Pygmy Blue Whale - Foraging	18	3	-
BIA	Short-tailed Shearwater - Foraging	10.6	1	-
BIA	Shy Albatross - Foraging	18	3	-
BIA	Southern Right Whale - Aggregation	17.3	1	-
BIA	Southern Right Whale - Migration	18	3	-
BIA	Wandering Albatross - Foraging	18	3	-
BIA	Wedge-tailed Shearwater - Foraging	18	3	-
BIA	White Shark - Distribution	18	3	-
BIA	White Shark - Foraging	17.3	1	-
BIA	White-faced Storm-petrel - Foraging	-	-	-

Release location 3 - Entrained Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (10m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	30,877.90	100	94
BIA	Australasian Gannet - Foraging	96.9	13	-
BIA	Australian Sea Lion - Foraging	-	-	-
BIA	Black Petrel - Foraging	11.2	1	-
BIA	Black-browed Albatross - Foraging	30,877.90	100	94
BIA	Black-faced Cormorant - Foraging	808.8	22	6
BIA	Bullers Albatross - Foraging	30,877.90	100	94
BIA	Campbell Albatross - Foraging	30,877.90	100	94
BIA	Common Diving-petrel - Foraging	30,877.90	100	94
BIA	Flesh-footed Shearwater - Foraging	11.2	1	-
BIA	Great-winged Petrel - Foraging	11.2	1	-
BIA	Grey Nurse Shark - Foraging	21.1	1	-
BIA	Grey Nurse Shark - Migration	24.6	2	-
BIA	Humpback Whale - Foraging	31.6	2	-
BIA	Indian Yellow-nosed Albatross - Foraging	30,877.90	100	94
BIA	Indo-Pacific/Spotted Bottlenose Dolphin - Breeding	32.6	1	-
BIA	Little Penguin - Breeding	47.2	9	-
BIA	Little Penguin - Foraging	714.5	22	6
BIA	Northern Giant Petrel - Foraging	11.2	1	-
BIA	Pygmy Blue Whale - Distribution	30,877.90	100	94
BIA	Pygmy Blue Whale - Foraging	30,877.90	100	94
BIA	Short-tailed Shearwater - Breeding	329.6	15	2
BIA	Short-tailed Shearwater - Foraging	30,877.90	100	94
BIA	Shy Albatross - Foraging	30,877.90	100	94
BIA	Soft-plumaged Petrel - Foraging	58.2	3	-
BIA	Sooty Shearwater - Foraging	16.5	1	-
BIA	Southern Giant Petrel - Foraging	11.2	1	-
BIA	Southern Right Whale - Aggregation	631.8	8	2
BIA	Southern Right Whale - Breeding	-	-	-
BIA	Southern Right Whale - Connecting Habitat	475.7	18	3
BIA	Southern Right Whale - Migration	30,877.90	100	94
BIA	Sperm Whale - Foraging	-	-	-
BIA	Wandering Albatross - Foraging	30,877.90	100	94
BIA	Wedge-tailed Shearwater - Foraging	30,877.90	100	94
BIA	White Shark - Breeding	45.2	6	-
BIA	White Shark - Distribution	30,877.90	100	94
BIA	White Shark - Foraging	409.7	19	2
BIA	White-capped Albatross - Foraging	11.2	1	-
BIA	White-faced Storm-petrel - Breeding	15.5	1	-
BIA	White-faced Storm-petrel - Foraging	1,089.90	36	14
BIA	Wilsons Storm Petrel - Migration	11.2	1	-

10-20 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (20m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	18	4	-
BIA	Australasian Gannet - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	18	4	-
BIA	Black-faced Cormorant - Foraging	-	-	-
BIA	Bullers Albatross - Foraging	18	4	-
BIA	Campbell Albatross - Foraging	18	4	-
BIA	Common Diving-petrel - Foraging	18	4	-
BIA	Indian Yellow-nosed Albatross - Foraging	18	4	-
BIA	Little Penguin - Foraging	-	-	-
BIA	Pygmy Blue Whale - Distribution	18	4	-
BIA	Pygmy Blue Whale - Foraging	18	4	-
BIA	Short-tailed Shearwater - Foraging	18	4	-
BIA	Shy Albatross - Foraging	18	4	-
BIA	Southern Right Whale - Aggregation	-	-	-
BIA	Southern Right Whale - Migration	18	4	-
BIA	Wandering Albatross - Foraging	18	4	-
BIA	Wedge-tailed Shearwater - Foraging	18	4	-
BIA	White Shark - Distribution	18	4	-
BIA	White Shark - Foraging	-	-	-
BIA	White-faced Storm-petrel - Foraging	-	-	-

Release location 4 - Entrained Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (10m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	26,900.90	95	93
BIA	Australasian Gannet - Foraging	405.7	37	7
BIA	Australian Sea Lion - Foraging	-	-	-
BIA	Black Petrel - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	26,900.90	95	93
BIA	Black-faced Cormorant - Foraging	1,290.40	32	13
BIA	Bullers Albatross - Foraging	26,900.90	95	93
BIA	Campbell Albatross - Foraging	26,900.90	95	93
BIA	Common Diving-petrel - Foraging	26,900.90	95	93
BIA	Flesh-footed Shearwater - Foraging	-	-	-
BIA	Great-winged Petrel - Foraging	-	-	-
BIA	Grey Nurse Shark - Foraging	10.3	1	-
BIA	Grey Nurse Shark - Migration	-	-	-
BIA	Humpback Whale - Foraging	13	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	26,900.90	95	93
BIA	Indo-Pacific/Spotted Bottlenose Dolphin - Breeding	14.2	1	-
BIA	Little Penguin - Breeding	43	9	-
BIA	Little Penguin - Foraging	1,193.90	29	13
BIA	Northern Giant Petrel - Foraging	-	-	-
BIA	Pygmy Blue Whale - Distribution	26,900.90	95	93
BIA	Pygmy Blue Whale - Foraging	26,900.90	95	93
BIA	Short-tailed Shearwater - Breeding	259.6	20	4
BIA	Short-tailed Shearwater - Foraging	26,900.90	95	93
BIA	Shy Albatross - Foraging	26,900.90	95	93
BIA	Soft-plumaged Petrel - Foraging	79	3	-
BIA	Sooty Shearwater - Foraging	23	1	-
BIA	Southern Giant Petrel - Foraging	-	-	-
BIA	Southern Right Whale - Aggregation	13.5	1	-
BIA	Southern Right Whale - Breeding	0.7	-	-
BIA	Southern Right Whale - Connecting Habitat	1,165.60	40	22
BIA	Southern Right Whale - Migration	26,900.90	95	93
BIA	Sperm Whale - Foraging	-	-	-
BIA	Wandering Albatross - Foraging	26,900.90	95	93
BIA	Wedge-tailed Shearwater - Foraging	26,900.90	95	93
BIA	White Shark - Breeding	58.6	3	-
BIA	White Shark - Distribution	26,900.90	95	93
BIA	White Shark - Foraging	938.5	40	22
BIA	White-capped Albatross - Foraging	-	-	-
BIA	White-faced Storm-petrel - Breeding	-	-	-
BIA	White-faced Storm-petrel - Foraging	1,735.30	43	25
BIA	Wilsons Storm Petrel - Migration	-	-	-

10-20 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (20m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	19.6	3	-
BIA	Australasian Gannet - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	19.6	3	-
BIA	Black-faced Cormorant - Foraging	10.3	1	-
BIA	Bullers Albatross - Foraging	19.6	3	-
BIA	Campbell Albatross - Foraging	19.6	3	-
BIA	Common Diving-petrel - Foraging	19.6	3	-
BIA	Indian Yellow-nosed Albatross - Foraging	19.6	3	-
BIA	Little Penguin - Foraging	10.3	1	-
BIA	Pygmy Blue Whale - Distribution	19.6	3	-
BIA	Pygmy Blue Whale - Foraging	19.6	3	-
BIA	Short-tailed Shearwater - Foraging	19.6	3	-
BIA	Shy Albatross - Foraging	19.6	3	-
BIA	Southern Right Whale - Aggregation	-	-	-
BIA	Southern Right Whale - Migration	19.6	3	-
BIA	Wandering Albatross - Foraging	19.6	3	-
BIA	Wedge-tailed Shearwater - Foraging	19.6	3	-
BIA	White Shark - Distribution	19.6	3	-
BIA	White Shark - Foraging	-	-	-
BIA	White-faced Storm-petrel - Foraging	10.9	1	-

Release location 5 - Entrained Exposure

0-10 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (10m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	32,757.50	98	91
BIA	Australasian Gannet - Foraging	1,198.20	33	15
BIA	Australian Sea Lion - Foraging	-	-	-
BIA	Black Petrel - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	32,757.50	98	91
BIA	Black-faced Cormorant - Foraging	656.3	33	9
BIA	Bullers Albatross - Foraging	32,757.50	98	91
BIA	Campbell Albatross - Foraging	32,757.50	98	91
BIA	Common Diving-petrel - Foraging	32,757.50	98	91
BIA	Flesh-footed Shearwater - Foraging	-	-	-
BIA	Great-winged Petrel - Foraging	-	-	-
BIA	Grey Nurse Shark - Foraging	-	-	-
BIA	Grey Nurse Shark - Migration	-	-	-
BIA	Humpback Whale - Foraging	11	1	-
BIA	Indian Yellow-nosed Albatross - Foraging	32,757.50	98	91
BIA	Indo-Pacific/Spotted Bottlenose Dolphin - Breeding	-	-	-
BIA	Little Penguin - Breeding	45.2	9	-
BIA	Little Penguin - Foraging	641.2	29	9
BIA	Northern Giant Petrel - Foraging	-	-	-
BIA	Pygmy Blue Whale - Distribution	3,060.70	40	24
BIA	Pygmy Blue Whale - Foraging	6,584.90	64	38
BIA	Short-tailed Shearwater - Breeding	327.4	28	5
BIA	Short-tailed Shearwater - Foraging	32,757.50	98	91
BIA	Shy Albatross - Foraging	32,757.50	98	91
BIA	Soft-plumaged Petrel - Foraging	933.7	38	10
BIA	Sooty Shearwater - Foraging	183.8	17	2
BIA	Southern Giant Petrel - Foraging	-	-	-
BIA	Southern Right Whale - Aggregation	-	-	-
BIA	Southern Right Whale - Breeding	11.9	1	-
BIA	Southern Right Whale - Connecting Habitat	379.6	33	8
BIA	Southern Right Whale - Migration	3,402.50	40	24
BIA	Sperm Whale - Foraging	-	-	-
BIA	Wandering Albatross - Foraging	32,757.50	98	91
BIA	Wedge-tailed Shearwater - Foraging	30.7	1	-
BIA	White Shark - Breeding	-	-	-
BIA	White Shark - Distribution	32,757.50	98	91
BIA	White Shark - Foraging	607.1	20	7
BIA	White-capped Albatross - Foraging	-	-	-
BIA	White-faced Storm-petrel - Breeding	-	-	-
BIA	White-faced Storm-petrel - Foraging	32,757.50	98	91
BIA	Wilsons Storm Petrel - Migration	-	-	-

10-20 m depth layer

Receptor Category	Receptor	Maximum entrained hydrocarbon concentration (20m)	Probability of low entrained hydrocarbon exposure (10 ppb)	Probability of high entrained hydrocarbon exposure (100 ppb)
BIA	Antipodean Albatross - Foraging	16.6	3	-
BIA	Australasian Gannet - Foraging	-	-	-
BIA	Black-browed Albatross - Foraging	16.6	3	-
BIA	Black-faced Cormorant - Foraging	-	-	-
BIA	Bullers Albatross - Foraging	16.6	3	-
BIA	Campbell Albatross - Foraging	16.6	3	-
BIA	Common Diving-petrel - Foraging	16.6	3	-
BIA	Indian Yellow-nosed Albatross - Foraging	16.6	3	-
BIA	Little Penguin - Foraging	-	-	-
BIA	Pygmy Blue Whale - Distribution	11.3	1	-
BIA	Pygmy Blue Whale - Foraging	16.6	3	-
BIA	Short-tailed Shearwater - Foraging	16.6	3	-
BIA	Shy Albatross - Foraging	16.6	3	-
BIA	Southern Right Whale - Aggregation	-	-	-
BIA	Southern Right Whale - Migration	11.3	1	-
BIA	Wandering Albatross - Foraging	16.6	3	-
BIA	Wedge-tailed Shearwater - Foraging	-	-	-
BIA	White Shark - Distribution	16.6	3	-
BIA	White Shark - Foraging	-	-	-
BIA	White-faced Storm-petrel - Foraging	16.6	3	-

APPENDIX D

EPBC Act Protected Matters Search Tool Results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 20-Mar-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	39
Listed Migratory Species:	39

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	60
Whales and Other Cetaceans:	31
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	3
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	34
Key Ecological Features (Marine):	1
Biologically Important Areas:	22
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
EEZ and Territorial Sea

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
FISH		
Hoplostethus atlanticus		
Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
REPTILE		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Centrophorus uyato listed as Centrophorus zeehaani		
Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis		
Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Stercorarius skua as Catharacta skua		
Great Skua [823]		Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei as Thalassarche sp. nov.		
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma		
Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Zeehan	Multiple Use Zone (IUCN VI)
Nelson	Special Purpose Zone (IUCN VI)
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Otway Astrolabe 3D Marine Seismic Survey, Otway Basin	2012/6421		Completed
Controlled action			
Alston-1 petroleum exploration well, permit VIC/P44	2003/1315	Controlled Action	Post-Approval
Otway Development	2002/621	Controlled Action	Post-Approval
VICP61 2D Marine Seismic Survey	2008/4075	Controlled Action	Completed
Not controlled action			
Amrit-1 exploration well	2004/1572	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Not controlled action (particular manner)			
2D Marine Seismic Survey	2005/2295	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey in Permit Areas T/32P and T/33P	2002/845	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2003/1214	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey, Petroleum Exploration Permit Area EPP27	2006/2776	Not Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		(Particular Manner)	
2D Seismic Survey in VIC/P50 and VIC/P46	2004/1810	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey VIC/P50	2005/2313	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey near King Island	2004/1461	Not Controlled Action (Particular Manner)	Post-Approval
Astrolabe 3D Marine Seismic Survey	2011/6048	Not Controlled Action (Particular Manner)	Post-Approval
Bernoulli 3D Seismic Survey	2006/3053	Not Controlled Action (Particular Manner)	Post-Approval
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval
Drill and Profile Exploration Well Somerset 1, License Area T34P	2009/5037	Not Controlled Action (Particular Manner)	Post-Approval
Geographe-A gas exploration well	2000/82	Not Controlled Action (Particular Manner)	Post-Approval
Hydrocarbon exploration wells	2003/1062	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
La Bella 3D Marine Seismic Survey, Otway Basin, VIC	2012/6683	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Otway Basin Exploration Drilling Campaign, Vic	2011/6125	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Survey VIC-P46	2002/826	Not Controlled Action (Particular Manner)	Post-Approval
Southern Margins T/35P and T/36P 3D Seismic Surveys	2007/3817	Not Controlled Action (Particular Manner)	Post-Approval
Surface Geochemical Exploration Program, TAS	2010/5780	Not Controlled Action (Particular Manner)	Post-Approval
Thylacine-A Exploration Well	2000/81	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5700	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 2D seismic survey	2002/811	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 3D seismic survey	2002/799	Not Controlled Action (Particular Manner)	Post-Approval
Wolseley 3D seismic acquisition survey	2010/5703	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
2D & 3D Seismic Surveys - Permit Area - VIC/P50	2008/4517	Referral Decision	Completed
3D Seismic Survey	2008/4014	Referral Decision	Completed
VICP61 2D Marine Seismic Survey	2008/3975	Referral Decision	Completed
Wolseley 3D Seismic Acquisition Survey in Permit T/32P	2010/5291	Referral Decision	Completed

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
West Tasmania Canyons	South-east

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur
Morus serrator Australasian Gannet [1020]	Foraging	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Sharks		
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur
Eubalaena australis Southern Right Whale [40]	Aggregation	Known to occur
Eubalaena australis Southern Right Whale [40]	Known core range	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 21-Mar-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	6
Wetlands of International Importance (Ramsar	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	17
Listed Threatened Species:	195
Listed Migratory Species:	86

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	81
Commonwealth Heritage Places:	14
Listed Marine Species:	142
Whales and Other Cetaceans:	34
Critical Habitats:	1
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	15
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	339
Regional Forest Agreements:	5
Nationally Important Wetlands:	37
EPBC Act Referrals:	342
Key Ecological Features (Marine):	6
Biologically Important Areas:	64
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status
Tasmanian Wilderness	TAS	Declared property

National Heritage Places [Resource Information]

Name	State	Legal Status
Historic		
Recherche Bay (North East Peninsula) Area	TAS	Listed place
Great Ocean Road and Scenic Environs	VIC	Listed place
Point Nepean Defence Sites and Quarantine Station Area	VIC	Listed place
Quarantine Station and Surrounds	VIC	Within listed place
Indigenous		
Western Tasmania Aboriginal Cultural Landscape	TAS	Listed place
Natural		
Tasmanian Wilderness	TAS	Listed place

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Corner inlet	Within Ramsar site
Gippsland lakes	Within 10km of Ramsar site
Glenelg estuary and discovery bay wetlands	Within Ramsar site
Lavinia	Within Ramsar site
Piccaninnie ponds karst wetlands	Within Ramsar site
Port phillip bay (western shoreline) and bellarine peninsula	Within Ramsar site
Western port	Within Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name

Feature Name
EEZ and Territorial Sea
EEZ and Territorial Sea

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community likely to occur within area
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area
Brogo Vine Forest of the South East Corner Bioregion	Endangered	Community likely to occur within area
Giant Kelp Marine Forests of South East Australia	Endangered	Community likely to occur within area
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Community known to occur within area
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area
Lowland Native Grasslands of Tasmania	Critically Endangered	Community likely to occur within area
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community likely to occur within area
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Community Name	Threatened Category	Presence Text
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area
Tasmanian white gum (Eucalyptus viminalis) wet forest	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Acanthiza pusilla magnirostris listed as Acanthiza pusilla archibaldi		
King Island Brown Thornbill, Brown Thornbill (King Island) [91709]	Endangered	Species or species habitat known to occur within area
Acanthornis magna greeniana		
King Island Scrubtit, Scrubtit (King Island) [82329]	Critically Endangered	Species or species habitat known to occur within area
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Aquila audax fleayi		
Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area

Scientific Name	Threatened Category	Presence Text
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii graptogyne South-eastern Red-tailed Black-Cockatoo [25982]	Endangered	Foraging, feeding or related behaviour known to occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Breeding known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pardalotus quadragintus Forty-spotted Pardalote [418]	Endangered	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Platycercus caledonicus brownii Green Rosella (King Island) [67041]	Vulnerable	Species or species habitat known to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Breeding known to occur within area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Strepera fuliginosa colei Black Currawong (King Island) [67113]	Vulnerable	Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus cucullatus		
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population)		
Masked Owl (Tasmanian) [67051]	Vulnerable	Breeding known to occur within area
CRUSTACEAN		
Astacopsis gouldi		
Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat likely to occur within area
Engaeus martigener		
Furneaux Burrowing Crayfish [67220]	Endangered	Species or species habitat may occur within area
Euastacus bispinosus		
Glenelg Spiny Freshwater Crayfish, Pricklyback [81552]	Endangered	Species or species habitat known to occur within area
FISH		
Brachionichthys hirsutus		
Spotted Handfish [64418]	Critically Endangered	Species or species habitat may occur within area
Brachiopsilus ziebelli		
Ziebell's Handfish, Waterfall Bay Handfish [83757]	Vulnerable	Species or species habitat likely to occur within area
Epinephelus daemelii		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Hoplostethus atlanticus		
Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area
Nannoperca obscura		
Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat known to occur within area
Nannoperca variegata		
Variegated Pygmy Perch, Ewens Pygmy Perch, Golden Pygmy Perch [26178]	Vulnerable	Species or species habitat known to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Rexea solandri (eastern Australian population)		
Eastern Gemfish [76339]	Conservation Dependent	Species or species habitat likely to occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
Thymichthys politus		
Red Handfish [83756]	Critically Endangered	Species or species habitat may occur within area
FROG		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Litoria watsoni		
Watson's Tree Frog [91509]	Endangered	Species or species habitat known to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
INSECT		
Antipodia chaostola leucophaea		
Tasmanian Chaostola Skipper, Heath-sand Skipper [77672]	Endangered	Species or species habitat may occur within area
Oreisplanus munionga larana		
Marrawah Skipper, Alpine Sedge Skipper, Alpine Skipper [77747]	Vulnerable	Species or species habitat known to occur within area
Synemon plana		
Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area
MAMMAL		
Antechinus minimus maritimus		
Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Dasyurus maculatus maculatus (Tasmanian population)		
Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus viverrinus		
Eastern Quoll, Luaner [333]	Endangered	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Mastacomys fuscus mordicus		
Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area
Miniopterus orianae bassanii		
Southern Bent-wing Bat [87645]	Critically Endangered	Breeding known to occur within area
Mirounga leonina		
Southern Elephant Seal [26]	Vulnerable	Breeding may occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area
Perameles gunnii gunnii		
Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat likely to occur within area
Perameles gunnii Victorian subspecies		
Eastern Barred Bandicoot (Mainland) [88020]	Endangered	Translocated population known to occur within area
Petauroides volans		
Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area
Petaurus australis australis		
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area
Potorous longipes		
Long-footed Potoroo [217]	Endangered	Species or species habitat likely to occur within area
Potorous tridactylus trisulcatus		
Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus		
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pseudomys shortridgei		
Heath Mouse, Dayang, Heath Rat [77]	Endangered	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
OTHER		
Hyridella glenelgensis		
Glenelg Freshwater Mussel [82953]	Critically Endangered	Species or species habitat may occur within area
Megascolides australis		
Giant Gippsland Earthworm [64420]	Vulnerable	Species or species habitat may occur within area
PLANT		
Acacia constablei		
Narrabarba Wattle [10798]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area
Astelia australiana Tall Astelia [10851]	Vulnerable	Species or species habitat may occur within area
Caladenia calcicola Limestone Spider-orchid [10065]	Vulnerable	Species or species habitat likely to occur within area
Caladenia caudata Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat may occur within area
Caladenia colorata Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid [54999]	Endangered	Species or species habitat known to occur within area
Caladenia dienema Windswept Spider-orchid [64858]	Endangered	Species or species habitat known to occur within area
Caladenia hastata Melblom's Spider-orchid [16118]	Endangered	Species or species habitat likely to occur within area
Caladenia insularis French Island Spider-orchid [24372]	Vulnerable	Species or species habitat known to occur within area
Caladenia lindleyana Lindley's Spider-orchid [9305]	Critically Endangered	Species or species habitat known to occur within area
Caladenia orientalis Eastern Spider Orchid [83410]	Endangered	Species or species habitat known to occur within area
Caladenia ornata Ornate Pink Fingers [76213]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Caladenia robinsonii Frankston Spider-orchid [24375]	Endangered	Species or species habitat likely to occur within area
Caladenia tensa Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat may occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area
Calochilus pulchellus Pretty Beard Orchid, Pretty Beard-orchid [84677]	Endangered	Species or species habitat may occur within area
Centrolepis pedderensis Pedder Centrolepis, Pedder Bristlewort [12647]	Endangered	Species or species habitat likely to occur within area
Colobanthus curtisiae Curtis' Colobanth [23961]	Vulnerable	Species or species habitat may occur within area
Correa lawrenceana var. genoensis Genoa River Correa [66626]	Endangered	Species or species habitat may occur within area
Corunastylis brachystachya Short-spiked Midge-orchid, Rocky Cape Midge Orchid [76410]	Endangered	Species or species habitat known to occur within area
Craspedia preminghana Preminghana Billybutton [77046]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Diuris lanceolata Snake Orchid [10231]	Endangered	Species or species habitat known to occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat may occur within area
Epacris virgata Pretty Heath, Dan Hill Heath [20375]	Endangered	Species or species habitat known to occur within area
Eucalyptus strzeleckii Strzelecki Gum [55400]	Vulnerable	Species or species habitat known to occur within area
Euphrasia amphisysepala Shiny Cliff Eyebright [4534]	Vulnerable	Species or species habitat known to occur within area
Euphrasia collina subsp. muelleri Purple Eyebright, Mueller's Eyebright [16151]	Endangered	Species or species habitat known to occur within area
Euphrasia fragosa Shy Eyebright, Southport Eyebright [64901]	Critically Endangered	Species or species habitat may occur within area
Euphrasia gibbsiae subsp. psilantherea Swamp Eyebright [21507]	Critically Endangered	Species or species habitat known to occur within area
Euphrasia semipicta Peninsula Eyebright [9986]	Endangered	Species or species habitat known to occur within area
Euphrasia sp. Bivouac Bay (W.R.Barker 7626 et al.) Masked Eyebright, Masked Cliff Eyebright [82044]	Endangered	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Grevillea infecunda Anglesea Grevillea [22026]	Vulnerable	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area
Hiya distans listed as Hypolepis distans Scrambling Ground-fern [92548]	Endangered	Species or species habitat known to occur within area
Ixodia achillaeoides subsp. arenicola Sand Ixodia, Ixodia [21474]	Vulnerable	Species or species habitat known to occur within area
Lachnagrostis adamsonii Adamson's Blown-grass, Adamson's Blowngrass [76211]	Endangered	Species or species habitat known to occur within area
Leiocarpa gatesii Wrinkled Buttons [76212]	Vulnerable	Species or species habitat likely to occur within area
Lepidium aschersonii Spiny Peppercress [10976]	Vulnerable	Species or species habitat known to occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat known to occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Lomatia tasmanica King's Lomatia [3745]	Critically Endangered	Species or species habitat known to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phaius australis		
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Pimelea spinescens subsp. spinescens		
Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat likely to occur within area
Pomaderris halmaturina subsp. halmaturina		
Kangaroo Island Pomaderris [21964]	Vulnerable	Species or species habitat known to occur within area
Pomaderris parrisiae		
Parris' Pomaderris [22119]	Vulnerable	Species or species habitat known to occur within area
Prasophyllum apoxychilum		
Tapered Leek-orchid [64947]	Endangered	Species or species habitat known to occur within area
Prasophyllum atratum		
Three Hummock Leek-orchid [82677]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum castaneum		
Chestnut Leek-orchid [64948]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum diversiflorum		
Gorae Leek-orchid [13210]	Endangered	Species or species habitat likely to occur within area
Prasophyllum favonium		
Western Leek-orchid [64949]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum frenchii		
Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat known to occur within area
Prasophyllum litorale listed as Prasophyllum littorale		
Coastal Leek Orchid [55234]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Prasophyllum pulchellum Pretty Leek-orchid [64953]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum secutum Northern Leek-orchid [64954]	Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat known to occur within area
Pseudocephalozia paludicola Alpine Leafy Liverwort [66441]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat known to occur within area
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat known to occur within area
Pterostylis rubenachii Arthur River Greenhood [64536]	Endangered	Species or species habitat known to occur within area
Pterostylis tenuissima Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat known to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat likely to occur within area
Rutidosis leptorhynchoides Button Wrinklewort [67251]	Endangered	Species or species habitat may occur within area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat known to occur within area
Taraxacum cygnorum Coast Dandelion, Native Dandelion [2508]	Vulnerable	Species or species habitat known to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area
Thelymitra jonesii Sky-blue Sun-orchid [76352]	Endangered	Species or species habitat known to occur within area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat known to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Carinascincus palfreymani Pedra Branca Skink, Pedra Branca Cool-skink, Red-throated Skink [90203]	Vulnerable	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Tympanocryptis pinguicolla		
Victorian Grassland Earless Dragon [66727]	Endangered	Species or species habitat known to occur within area
SEASTAR		
Parvulastra vivipara		
Tasmanian Live-bearing Seastar [85451]	Vulnerable	Species or species habitat may occur within area
SHARK		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Centrophorus harrissoni		
Harrisson's Dogfish, Endeavour Dogfish, Dumb Gulper Shark, Harrison's Deepsea Dogfish [68444]	Conservation Dependent	Species or species habitat likely to occur within area
Centrophorus uyato listed as Centrophorus zeehaani		
Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat likely to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Zearaja maugeana Maugean Skate, Port Davey Skate [83504]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat known to occur within area
Ardenna grisea Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera bonaerensis		
Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus		
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Eubalaena australis as Balaena glacialis australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Isurus oxyrinchus		
Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Megaptera novaeangliae Humpback Whale [38]		Foraging, feeding or related behaviour known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Foraging, feeding or related behaviour known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Symposiachrus trivirgatus as Monarcha trivirgatus		
Spectacled Monarch [83946]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba		
Sanderling [875]		Roosting known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Roosting known to occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area

Scientific Name	Threatened Category	Presence Text
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa incana Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Defence	
Defence - CROWS NEST CAMP - QUEENSCLIFF [21026]	VIC
Defence - CROWS NEST CAMP - QUEENSCLIFF [21027]	VIC

Commonwealth Land Name	State
Defence - CROWS NEST CAMP - QUEENSCLIFF [21029]	VIC
Defence - CROWS NEST CAMP - QUEENSCLIFF [21028]	VIC
Defence - HMAS CERBERUS [20082]	VIC
Defence - HMAS CERBERUS [20080]	VIC
Defence - HMAS CERBERUS [20083]	VIC
Defence - HMAS CERBERUS [20081]	VIC
Defence - HMAS CERBERUS [20086]	VIC
Defence - HMAS CERBERUS [20087]	VIC
Defence - HMAS CERBERUS [20084]	VIC
Defence - HMAS CERBERUS [20085]	VIC
Defence - HMAS CERBERUS [20088]	VIC
Defence - HMAS CERBERUS [20089]	VIC
Defence - HMAS CERBERUS [20095]	VIC
Defence - HMAS CERBERUS [20104]	VIC
Defence - HMAS CERBERUS [20100]	VIC
Defence - HMAS CERBERUS [20101]	VIC
Defence - HMAS CERBERUS [20103]	VIC
Defence - HMAS CERBERUS [20102]	VIC
Defence - HMAS CERBERUS [20093]	VIC
Defence - HMAS CERBERUS [20091]	VIC
Defence - HMAS CERBERUS [20098]	VIC
Defence - HMAS CERBERUS [20099]	VIC
Defence - HMAS CERBERUS [20090]	VIC
Defence - HMAS CERBERUS [20092]	VIC
Defence - HMAS CERBERUS [20094]	VIC
Defence - HMAS CERBERUS [20097]	VIC
Defence - HMAS CERBERUS [20096]	VIC

Commonwealth Land Name	State
Defence - STAFF COLLEGE-FORT QUEENSCLIFF [21030]	VIC
Defence - STAFF COLLEGE-FORT QUEENSCLIFF [21031]	VIC
Defence - STAFF COLLEGE-FORT QUEENSCLIFF [21032]	VIC
Defence - STAFF COLLEGE-FORT QUEENSCLIFF [21033]	VIC
Defence - STAFF COLLEGE-FORT QUEENSCLIFF [21034]	VIC
Defence - SWAN ISLAND TRAINING AREA [21448]	VIC
Defence - SWAN ISLAND TRAINING AREA [21446]	VIC
Defence - SWAN ISLAND TRAINING AREA [21447]	VIC
Defence - TRAINING CENTRE (Norris Barracks) - Portsea [21025]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21022]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21023]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21024]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21020]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21021]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21010]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21013]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21016]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21011]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21012]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21014]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21017]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21018]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21015]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21009]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21008]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21007]	VIC
Defence - Training Depot, Darts RD 3305 Portland [21019]	VIC

Commonwealth Land Name	State
Defence - WARRNAMBOOL TRAINING DEPOT [21111]	VIC
Defence - WEST HEAD GUNNERY RANGE [21112]	VIC
Transport and Regional Services - Australian Maritime Safety Authority	
Commonwealth Land - Australian Maritime Safety Authority [41289]	SA
Commonwealth Land - Australian Maritime Safety Authority [41288]	SA
Unknown	
Commonwealth Land - [21582]	VIC
Commonwealth Land - [60346]	TAS
Commonwealth Land - [21583]	VIC
Commonwealth Land - [21570]	VIC
Commonwealth Land - [21487]	VIC
Commonwealth Land - [21488]	VIC
Commonwealth Land - [21489]	VIC
Commonwealth Land - [21491]	VIC
Commonwealth Land - [21498]	VIC
Commonwealth Land - [21492]	VIC
Commonwealth Land - [21490]	VIC
Commonwealth Land - [21496]	VIC
Commonwealth Land - [21497]	VIC
Commonwealth Land - [60113]	TAS
Commonwealth Land - [21509]	VIC
Commonwealth Land - [22391]	VIC
Commonwealth Land - [60112]	TAS
Commonwealth Land - [60115]	TAS
Commonwealth Land - [60114]	TAS
Commonwealth Land - [60111]	TAS
Commonwealth Land - [60116]	TAS

Commonwealth Heritage Places

[Resource Information]

Name	State	Status
Historic		
Cape Northumberland Lighthouse	SA	Listed place
Cape Sorell Lighthouse	TAS	Listed place
Cape Wickham Lighthouse	TAS	Listed place
Fort Queenscliff	VIC	Listed place
Gabo Island Lighthouse	VIC	Listed place
Goose Island Lighthouse	TAS	Listed place
HMAS Cerberus Central Area Group	VIC	Listed place
Sorrento Post Office	VIC	Listed place
Swan Island Defence Precinct	VIC	Listed place
Tasman Island Lighthouse	TAS	Listed place
Wilsons Promontory Lighthouse	VIC	Listed place
Natural		
HMAS Cerberus Marine and Coastal Area	VIC	Listed place
Swan Island and Naval Waters	VIC	Listed place
Tasmanian Seamounts Area	EXT	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat known to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans		
Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius bicinctus		
Double-banded Plover [895]		Roosting known to occur within area overfly marine area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus		
Red-capped Plover [881]		Roosting known to occur within area overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae		
Silver Gull [82326]		Breeding known to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni as Diomedea gibsoni		
Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area
Gallinago stenura Pin-tailed Snipe [841]		Roosting known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area overfly marine area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area
Morus capensis Cape Gannet [59569]		Breeding known to occur within area
Morus serrator Australasian Gannet [1020]		Breeding known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area overfly marine area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Breeding known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat known to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Pelecanoides urinatrix Common Diving-Petrel [1018]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area overfly marine area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area overfly marine area
Pterodroma macroptera Great-winged Petrel [1035]		Foraging, feeding or related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area
Sterna striata White-fronted Tern [799]		Breeding known to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding known to occur within area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area
Stiltia isabella Australian Pratincole [818]		Roosting known to occur within area overfly marine area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Tringa incana as Heteroscelus incanus Wandering Tattler [831]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys mollisoni Mollison's Pipefish [66260]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Vanacampus vercoi Verco's Pipefish [66286]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Breeding known to occur within area
Mirounga leonina Southern Elephant Seal [26]	Vulnerable	Breeding may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area
Reptile		

Scientific Name	Threatened Category	Presence Text
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis		
Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Foraging, feeding or related behaviour known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Phocoena dioptrica Spectacled Porpoise [66728]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Foraging, feeding or related behaviour known to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Critical Habitats [Resource Information]

Name	Type of Presence
Thalassarche cauta (Shy Albatross) - Albatross Island, The Mewstone, Pedra Branca	Listed Critical Habitat

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Huon	Habitat Protection Zone (IUCN IV)
Murray	Marine National Park Zone (IUCN II)

Park Name	Zone & IUCN Categories
Tasman Fracture	Marine National Park Zone (IUCN II)
Apollo	Multiple Use Zone (IUCN VI)
Beagle	Multiple Use Zone (IUCN VI)
Boags	Multiple Use Zone (IUCN VI)
East Gippsland	Multiple Use Zone (IUCN VI)
Franklin	Multiple Use Zone (IUCN VI)
Huon	Multiple Use Zone (IUCN VI)
Murray	Multiple Use Zone (IUCN VI)
Tasman Fracture	Multiple Use Zone (IUCN VI)
Zeehan	Multiple Use Zone (IUCN VI)
Murray	Special Purpose Zone (IUCN VI)
Nelson	Special Purpose Zone (IUCN VI)
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Actaeon Island	Game Reserve	TAS
Aire River	Heritage River	VIC
Aire River W.R.	Natural Features Reserve	VIC
Aireys Inlet B.R.	Natural Features Reserve	VIC
Albatross Island	Nature Reserve	TAS
Anglesea B.R.	Natural Features Reserve	VIC
Anser Island	Reference Area	VIC
Arthur Bay	Conservation Area	TAS

Protected Area Name	Reserve Type	State
Arthur-Pieman	Conservation Area	TAS
Arthurs Seat	State Park	VIC
Baawang	Reference Area	VIC
Badger Box Creek	Nature Reserve	TAS
Badger Island	Indigenous Protected Area	TAS
Badger River	Regional Reserve	TAS
Bald Hills B.R.	Natural Features Reserve	VIC
Balnarring G95 B.R.	Natural Features Reserve	VIC
Barham Paradise S.R.	Natural Features Reserve	VIC
Barwon Bluff	Marine Sanctuary	VIC
Bass Pyramid	Nature Reserve	TAS
Bass River SS.R.	Natural Features Reserve	VIC
Bats Ridge W.R	Nature Conservation Reserve	VIC
Bay of Islands Coastal Park	Conservation Park	VIC
Bellarine I109 B.R.	Natural Features Reserve	VIC
Bellarine I110 B.R.	Natural Features Reserve	VIC
Bemm, Goolengook, Arte and Errinundra Rivers	Heritage River	VIC
Ben Boyd	National Park	NSW
Benedore River	Reference Area	VIC
Big Green Island	Nature Reserve	TAS
Bird Island	Game Reserve	TAS
Bittern B.R.	Natural Features Reserve	VIC
Black Pyramid Rock	Nature Reserve	TAS

Protected Area Name	Reserve Type	State
Blyth Point	Conservation Area	TAS
Bolwarra H43 B.R.	Natural Features Reserve	VIC
Bolwarra H44 B.R.	Natural Features Reserve	VIC
Bolwarra H45 B.R.	Natural Features Reserve	VIC
Breamlea F.F.R.	Nature Conservation Reserve	VIC
Brick Islands	Conservation Area	TAS
Brougham Sugarloaf	Conservation Area	TAS
Buckley N.C.R.	Natural Features Reserve	VIC
Bucks Lake	Game Reserve	SA
Bun Beetons Point	Conservation Area	TAS
Bunurong	Marine National Park	VIC
Bunurong Marine Park	National Parks Act Schedule 4 park or reserve	VIC
Calder River	Reference Area	VIC
Calm Bay	State Reserve	TAS
Canunda	National Park	SA
Cape Conran Coastal Park	Conservation Park	VIC
Cape Howe	Wilderness Zone	VIC
Cape Howe	Marine National Park	VIC
Cape Liptrap Coastal Park	Conservation Park	VIC
Cape Nelson	State Park	VIC
Cape Patterson N.C.R	Natural Features Reserve	VIC
Cape Sorell	Historic Site	TAS
Cape Wickham	State Reserve	TAS
Cape Wickham	Conservation Area	TAS

Protected Area Name	Reserve Type	State
Carpenter Rocks	Conservation Park	SA
Catamaran River	Conservation Area	TAS
Cataraqui Point	Conservation Area	TAS
Chalky Island	Conservation Area	TAS
Chappell Islands	Nature Reserve	TAS
Christmas Island	Nature Reserve	TAS
Churchill Island	Marine National Park	VIC
City of Melbourne Bay	Conservation Area	TAS
Colliers Forest Reserve	Conservation Covenant	TAS
Colliers Swamp	Conservation Area	TAS
Cone Islet	Conservation Area	TAS
Conewarre K47 SS.R.	Natural Features Reserve	VIC
Conewarre K48 SS.R.	Natural Features Reserve	VIC
Corinella Cemetery B.R.	Natural Features Reserve	VIC
Corner Inlet	Marine National Park	VIC
Corner Inlet Marine and Coastal Park	National Parks Act Schedule 4 park or reserve	VIC
Councillor Island	Nature Reserve	TAS
Counsel Hill	Conservation Area	TAS
Craggy Island	Conservation Area	TAS
Crib Point G228 B.R.	Natural Features Reserve	VIC
Crib Point G229 B.R.	Natural Features Reserve	VIC
Croajingolong	National Park	VIC
Curdie Vale N.C.R.	Natural Features Reserve	VIC
Currie Lightkeepers Residence	Historic Site	TAS

Protected Area Name	Reserve Type	State
Curtis Island	Nature Reserve	TAS
D'Entrecasteaux Watering Place	Historic Site	TAS
Deen Maar	Indigenous Protected Area	VIC
Deep Lagoons	Conservation Area	TAS
Devilbend N.F.R.	Natural Features Reserve	VIC
Devils Tower	Nature Reserve	TAS
Dingley Dell	Conservation Park	SA
Disappointment Bay	State Reserve	TAS
Discovery Bay	Marine National Park	VIC
Discovery Bay Coastal Park	Conservation Park	VIC
Double Creek	Natural Catchment Area	VIC
Douglas Point	Conservation Park	SA
Drakes B.R.	Natural Features Reserve	VIC
Dromana B.R.	Natural Features Reserve	VIC
Drumdlemara H1 B.R	Natural Features Reserve	VIC
Drumdlemara H2 B.R	Natural Features Reserve	VIC
Drumdlemara H4 B.R	Natural Features Reserve	VIC
Dry Creek	Forest Reserve	SA
Eagle Rock	Marine Sanctuary	VIC
East Gippsland Coastal streams	Natural Catchment Area	VIC
East Kangaroo Island	Nature Reserve	TAS
East Moncoeur Island	Conservation Area	TAS
Edna Bowman N.C.R.	Natural Features Reserve	VIC

Protected Area Name	Reserve Type	State
Egg Beach	Conservation Area	TAS
Eldorado	Conservation Area	TAS
Emita	Nature Recreation Area	TAS
Ewens Ponds	Conservation Park	SA
Fingal B.R	Natural Features Reserve	VIC
Flinders G234 B.R.	Natural Features Reserve	VIC
Flinders N.F.R.	Natural Features Reserve	VIC
Four Mile Beach	Regional Reserve	TAS
French Island	National Park	VIC
French Island	Marine National Park	VIC
French Island (north)	Reference Area	VIC
French Island G230 B.R	Natural Features Reserve	VIC
Gentle Annie	Conservation Area	TAS
Glenelg River	Heritage River	VIC
Goose Island	Conservation Area	TAS
Goose Lagoon W.R	Natural Features Reserve	VIC
Gorae B.R.	Natural Features Reserve	VIC
Grantville N.C.R	Natural Features Reserve	VIC
Great Otway	National Park	VIC
Harbour Islets	Conservation Area	TAS
Harcus Island	Conservation Area	TAS
Harcus River Road Marrawah	Conservation Covenant	TAS
Hedditch Hill S.R.	Natural Features Reserve	VIC
Henderson Islets	Conservation Area	TAS

Protected Area Name	Reserve Type	State
Hippolyte Rocks	Marine Conservation Area	TAS
Hogan Group	Conservation Area	TAS
Hopkins Falls S.R.	Natural Features Reserve	VIC
Hunter Island	Conservation Area	TAS
Isabella Island	Nature Reserve	TAS
Jacksons Cove	Conservation Area	TAS
Johanna Falls S.R.	Natural Features Reserve	VIC
Johnstones Creek F.R	Nature Conservation Reserve	VIC
Kangaroo Island	Conservation Area	TAS
Kangerong N.C.R	Natural Features Reserve	VIC
Kentbruck H14 B.R	Natural Features Reserve	VIC
Kentbruck H50 B.R.	Natural Features Reserve	VIC
Kentford Forest	Conservation Area	TAS
Kentford Forest	Nature Reserve	TAS
Kentford Road	Conservation Covenant	TAS
Kent Group	National Park	TAS
Kilcunda N.C.R.	Natural Features Reserve	VIC
Killiecrankie	Nature Recreation Area	TAS
King Island	Conservation Covenant	TAS
Kings Run	Private Nature Reserve	TAS
Kings Run #2	Conservation Covenant	TAS
Lady Julia Percy Island W.R.	Nature Conservation Reserve	VIC
Lake Aringa W.R	Nature Conservation Reserve	VIC

Protected Area Name	Reserve Type	State
Lake Connewarre W.R	Natural Features Reserve	VIC
Lake Gillear W.R	Natural Features Reserve	VIC
Latrobe B.R.	Natural Features Reserve	VIC
Lavinia	State Reserve	TAS
Lawrence Rocks W.R.	Nature Conservation Reserve	VIC
Leongatha H3 B.R.	Natural Features Reserve	VIC
Leprena Trust - Sullivan Point	Conservation Covenant	TAS
Lily Lagoon	Nature Reserve	TAS
Lily Pond B.R.	Natural Features Reserve	VIC
Little Chalky Island	Conservation Area	TAS
Little Island	Conservation Area	TAS
Little Trefoil	Conservation Area	TAS
Lonsdale Lakes W.R	Nature Conservation Reserve	VIC
Loorana	Conservation Covenant	TAS
Lower Glenelg	National Park	VIC
Lower Glenelg River	Conservation Park	SA
Lower South East	Marine Park	SA
Low Point	Conservation Area	TAS
Lymwood	Conservation Covenant	TAS
Macquarie Harbour	Historic Site	TAS
Main Ridge N.C.R.	Natural Features Reserve	VIC
Mallacoota B.R.	Natural Features Reserve	VIC
Marengo N.C.R.	Nature Conservation Reserve	VIC

Protected Area Name	Reserve Type	State
Marengo Reefs	Marine Sanctuary	VIC
Marrawah #1	Conservation Covenant	TAS
Marrawah #3	Conservation Covenant	TAS
Marshall Beach	Conservation Area	TAS
Memana	Conservation Covenant	TAS
Merri	Marine Sanctuary	VIC
Merricks Creek B.R.	Natural Features Reserve	VIC
Mile Island	Conservation Area	TAS
Millwood Road	Conservation Covenant	TAS
Mornington Peninsula	National Park	VIC
Mortimers Paddock B.R.	Natural Features Reserve	VIC
Mount Bruny	Conservation Area	TAS
Mount Dundas	Regional Reserve	TAS
Mount Heemskirk	Regional Reserve	TAS
Mount Richmond	National Park	VIC
Mount Tanner	Nature Recreation Area	TAS
Mount Vereker Creek	Natural Catchment Area	VIC
Mouzie B.R	Natural Features Reserve	VIC
Mouzie N.F.R	Natural Features Reserve	VIC
Muddy Lagoon	Nature Reserve	TAS
Mulligans Hill	Conservation Area	TAS
Mulligans Hill	Conservation Covenant	TAS
Murkay Islets	Conservation Area	TAS
Mushroom Reef	Marine Sanctuary	VIC
Nadgee	Nature Reserve	NSW

Protected Area Name	Reserve Type	State
Nares Rocks	Conservation Area	TAS
Narrawong F.R.	Nature Conservation Reserve	VIC
Nelson SS.R.	Natural Features Reserve	VIC
Nene Valley	Conservation Park	SA
New Year Island	Game Reserve	TAS
Ninety Mile Beach	Marine National Park	VIC
Nooramunga Marine & Coastal Park	National Parks Act Schedule 4 park or reserve	VIC
North East Islet	Nature Reserve	TAS
North Western Port N.C.R.	Natural Features Reserve	VIC
Nugara	Conservation Covenant	TAS
Ocean Beach	Conservation Area	TAS
Olivers Creek B.R.	Natural Features Reserve	VIC
Painkalac Creek	Reference Area	VIC
Palana Beach	Nature Recreation Area	TAS
Parker River	Reference Area	VIC
Pasco Group	Conservation Area	TAS
Pegarah	Private Nature Reserve	TAS
Pegarah Forest	Conservation Covenant	TAS
Penguin Islet	Nature Reserve	TAS
Petrel Islands	Game Reserve	TAS
Phillip Island Nature Park	Other	VIC
Piccaninnie Ponds	Conservation Park	SA
Pieman River	State Reserve	TAS
Point Addis	Marine National Park	VIC

Protected Area Name	Reserve Type	State
Point Danger	Marine Sanctuary	VIC
Point Hicks	Marine National Park	VIC
Point Nepean	National Park	VIC
Porky Beach	Conservation Area	TAS
Port Campbell	National Park	VIC
Portland H46 B.R.	Natural Features Reserve	VIC
Portland H47 B.R.	Natural Features Reserve	VIC
Port Phillip Heads	Marine National Park	VIC
Preminghana	Indigenous Protected Area	TAS
Prime Seal Island	Conservation Area	TAS
Princetown W.R	Natural Features Reserve	VIC
Queenscliff N.F.R	Natural Features Reserve	VIC
Rame Head	Remote and Natural Area - Schedule 6, National Parks Act	VIC
Rebecca Creek	Conservation Area	TAS
Recherche Bay	Nature Recreation Area	TAS
Recherche Bay Reserve - Southport Lagoon	Conservation Covenant	TAS
Red Hut Point	Conservation Area	TAS
Red Hut Road #1	Conservation Covenant	TAS
Reef Island	Conservation Area	TAS
Reef Island and Bass River Mouth N.C.R	Natural Features Reserve	VIC
Reekara Road #1	Conservation Covenant	TAS
Reekara Road #2	Conservation Covenant	TAS
Reid Rocks	Nature Reserve	TAS

Protected Area Name	Reserve Type	State
Rodondo Island	Nature Reserve	TAS
Rosebud B.R.	Natural Features Reserve	VIC
Roydon Island	Conservation Area	TAS
Salt Lagoon, St Leonards W.R	Nature Conservation Reserve	VIC
Sandfly Beach	Conservation Covenant	TAS
Sandpatch	Wilderness Zone	VIC
Screw Creek N.C.R.	Natural Features Reserve	VIC
Seacrow Islet	Conservation Area	TAS
Sea Elephant	Conservation Area	TAS
Sea Elephant Bootlace	Conservation Covenant	TAS
Sea Elephant River	Conservation Covenant	TAS
Seal Creek	Reference Area	VIC
Seal Islands W.R.	Nature Conservation Reserve	VIC
Seal Rocks	State Reserve	TAS
Seal Rocks	Conservation Area	TAS
Sentinel Island	Conservation Area	TAS
Settlement Point	Conservation Area	TAS
Shallow Inlet Marine and Coastal Park	National Parks Act Schedule 4 park or reserve	VIC
Shell Islets	Conservation Area	TAS
Sister Islands	Conservation Area	TAS
Slaves Bay	Conservation Area	TAS
South Bruny	National Park	TAS
Southern Wilsons Promontory	Remote and Natural Area - Schedule 6, National Parks Act	VIC

Protected Area Name	Reserve Type	State
Southport Lagoon	Conservation Area	TAS
Southwest	National Park	TAS
Southwest	Conservation Area	TAS
Stack Island	Game Reserve	TAS
Stokes Point	Conservation Area	TAS
Stony Creek (Otways)	Reference Area	VIC
Strahan Customs House	Historic Site	TAS
Sugarloaf Rock	Conservation Area	TAS
Sundown Point	State Reserve	TAS
Swan Bay - Edwards Point W.R	Nature Conservation Reserve	VIC
Tambar	Conservation Covenant	TAS
Tarwin Lower F.R.	Nature Conservation Reserve	VIC
Tasman	National Park	TAS
Tathams Lagoon	Conservation Area	TAS
Teepookana	Regional Reserve	TAS
Temma	Conservation Covenant	TAS
The Arches	Marine Sanctuary	VIC
The Doughboys	Nature Reserve	TAS
Three Hummock Island	State Reserve	TAS
Tikkawoppa Plateau	Regional Reserve	TAS
Tower Hill W.R	Natural Features Reserve	VIC
Trewalla H48 B.R.	Natural Features Reserve	VIC
Trewalla H49 B.R.	Natural Features Reserve	VIC
Trial Harbour	State Reserve	TAS
Tully River	Conservation Area	TAS

Protected Area Name	Reserve Type	State
Twelve Apostles	Marine National Park	VIC
Tyrendarra F.R	Nature Conservation Reserve	VIC
Unnamed (No.HA1038)	Heritage Agreement	SA
Unnamed (No.HA1166)	Heritage Agreement	SA
Unnamed (No.HA1180)	Heritage Agreement	SA
Unnamed (No.HA1404)	Heritage Agreement	SA
Unnamed (No.HA1457)	Heritage Agreement	SA
Unnamed (No.HA1560)	Heritage Agreement	SA
Unnamed (No.HA26)	Heritage Agreement	SA
Unnamed (No.HA42)	Heritage Agreement	SA
Unnamed (No.HA497)	Heritage Agreement	SA
Unnamed C0293	Private Nature Reserve	VIC
Unnamed P0176	Private Nature Reserve	VIC
Upper South East	Marine Park	SA
Ventnor B.R.	Natural Features Reserve	VIC
Vereker Creek	Reference Area	VIC
Wallaby Islands	Conservation Area	TAS
Waratah B.R	Natural Features Reserve	VIC
Warra Creek	Regional Reserve	TAS
Warrengine Creek SS.R.	Natural Features Reserve	VIC
Welcome River	State Reserve	TAS
West Coast Range	Regional Reserve	TAS
West Moncoeur Island	Nature Reserve	TAS
West Point	State Reserve	TAS
Wicks Road Nugara	Conservation Covenant	TAS

Protected Area Name	Reserve Type	State
Wild Dog B.R.	Natural Features Reserve	VIC
Wild Dog Creek SS.R.	Natural Features Reserve	VIC
Wilsons Promontory	Wilderness Zone	VIC
Wilsons Promontory	National Park	VIC
Wilsons Promontory	Marine National Park	VIC
Wilsons Promontory Islands	Remote and Natural Area - Schedule 6, National Parks Act	VIC
Wilsons Promontory Marine Park	National Parks Act Schedule 4 park or reserve	VIC
Wilsons Promontory Marine Reserve	National Parks Act Schedule 4 park or reserve	VIC
Wongarra B.R.	Natural Features Reserve	VIC
Wonthaggi G237 B.R.	Natural Features Reserve	VIC
Wonthaggi G238 B.R.	Natural Features Reserve	VIC
Wonthaggi G239 B.R.	Natural Features Reserve	VIC
Wonthaggi G240 B.R.	Natural Features Reserve	VIC
Wonthaggi G241 B.R.	Natural Features Reserve	VIC
Wonthaggi Heathlands N.C.R	Natural Features Reserve	VIC
Wright Rock	Nature Reserve	TAS
Wybalenna Island	Conservation Area	TAS
Yambacoona	Conservation Covenant	TAS
Yambuk F.F.R.	Nature Conservation Reserve	VIC
Yambuk Wetlands N.C.R.	Natural Features Reserve	VIC

Protected Area Name	Reserve Type	State
Yanakie F.R	Nature Conservation Reserve	VIC
Yaringa	Marine National Park	VIC

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State
East Gippsland RFA	Victoria
Eden RFA	New South Wales
Gippsland RFA	Victoria
Tasmania RFA	Tasmania
West Victoria RFA	Victoria

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Aire River	VIC
Anderson Inlet	VIC
Benedore River	VIC
Bungaree Lagoon	TAS
Corner Inlet	VIC
Ewens Ponds	SA
Glenelg Estuary	VIC
Glenelg River	VIC
Lake Ashwood	TAS
Lake Bantick	TAS
Lake Connewarre State Wildlife Reserve	VIC
Lake Flannigan	TAS
Lake Garcia	TAS
Lavinia Nature Reserve	TAS
Long Swamp	VIC
Lower Aire River Wetlands	VIC

Wetland Name	State
Lower Merri River Wetlands	VIC
Mallacoota Inlet Wetlands	VIC
Mud Islands	VIC
Nadgee Lake and tributary wetlands	NSW
Pearshape Lagoon 1	TAS
Pearshape Lagoon 2	TAS
Pearshape Lagoon 3	TAS
Pearshape Lagoon 4	TAS
Piccaninnie Ponds	SA
Powlett River Mouth	VIC
Princetown Wetlands	VIC
Shallow Inlet Marine & Coastal Park	VIC
South East Cape Lakes	TAS
Swan Bay & Swan Island	VIC
Sydenham Inlet Wetlands	VIC
Tamboon Inlet Wetlands	VIC
Thurra River	VIC
Tower Hill	VIC
Unnamed Wetland	TAS
Western Port	VIC
Yambuk Wetlands	VIC

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Apollo Bay to Skenes Creek Coastal Trail	2022/09274		Assessment
Greater Gippsland Offshore Wind Project	2022/09379		Assessment
Greater Gippsland Offshore Wind Project Initial Marine Field Investigations	2022/09374		Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Otway Astrolabe 3D Marine Seismic Survey, Otway Basin	2012/6421		Completed
Robbins Island Renewable Energy Park, Robbins Island, Tasmania	2017/8096		Approval
Southern Winds Offshore Wind Project	2022/09435		Referral Decision
Southern Winds Offshore Wind Project Initial Marine Field Investigations	2022/09436		Referral Decision
Spinifex Offshore Surveys	2022/09359		Completed
Controlled action			
Alston-1 petroleum exploration well, permit VIC/P44	2003/1315	Controlled Action	Post-Approval
Bald Hills Wind Farm 80 Turbines	2002/730	Controlled Action	Post-Approval
Basalt Quarry Extension (Mountainview Quarry)	2004/1329	Controlled Action	Completed
Casino Gas Field Development	2003/1295	Controlled Action	Post-Approval
City Of Greater Geelong Mosquito Control Program 2021-2030, Vic	2020/8782	Controlled Action	Further Information Request
Construction of a factory for the production of ACV's	2007/3842	Controlled Action	Completed
Crib Point to Pakenham Gas Pipeline, Vic	2018/8297	Controlled Action	Completed
Dairy Farm expansion on the Woolnorth property	2013/6710	Controlled Action	Completed
DPIPWE - Arthur-Pieman Conservation Area - off-road vehicle mitigation actions	2017/8038	Controlled Action	Completed
Establishment of plantation for use of effluent water	2003/1063	Controlled Action	Completed
Gas Import Facility, Crib Point, Vic	2018/8298	Controlled Action	Completed
Geelong Salt Fields Urban Renewal Project	2012/6630	Controlled Action	Assessment Approach
Gippsland Regional Port Project	2020/8667	Controlled Action	Assessment Approach

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Glenelg Dolomite Quarry	2017/8021	Controlled Action	Post-Approval
Green Point Wind Farm	2001/529	Controlled Action	Post-Approval
Heemskirk Windfarm Development	2002/678	Controlled Action	Completed
Installation of replacement crude-condensate pipeline, Vic	2014/7202	Controlled Action	Post-Approval
Kentbruck Green Power Hub, Vic	2019/8510	Controlled Action	Assessment Approach
Lonsdale Golf Club Redevelopment	2003/969	Controlled Action	Post-Approval
Lorne Golf Course redevelopment	2004/1513	Controlled Action	Post-Approval
Mosquito Control	2005/2132	Controlled Action	Post-Approval
Otway Development	2002/621	Controlled Action	Post-Approval
Pacific Hydro (Portland) Wind Farm SW Victoria	2000/18	Controlled Action	Post-Approval
Pelican Point residential subdivision	2006/2529	Controlled Action	Completed
Port Phillip Bay Channel Deepening	2002/576	Controlled Action	Post-Approval
Redevelopment of post office and construction of dwellings	2007/3639	Controlled Action	Completed
Residential and Golf Course Development Project	2003/1144	Controlled Action	Post-Approval
Residential Estate, 251-319 Melaluka Rd	2007/3308	Controlled Action	Post-Approval
Residential Subdivision & Infrastructure Parish of Belfast	2005/1954	Controlled Action	Completed
Residential Subdivision and Stormwater Enhancements for land west of Ash Road	2012/6544	Controlled Action	Completed
Robbins Island Road to Hampshire Transmission Line	2020/8656	Controlled Action	Referral Decision
Schomberg 3D Marine Seismic Survey	2007/3754	Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Star of the South Offshore Wind Farm Project	2020/8650	Controlled Action	Guidelines Issued
Strike Oil Gas Exploration Well, Otway Basin (VIC/P44)	2000/97	Controlled Action	Completed
Tarkine Forest Drive Road Upgrade	2011/6210	Controlled Action	Post-Approval
The Tarkine Road Project	2009/5169	Controlled Action	Completed
Twelve Apostles Saddle Lookout	2019/8571	Controlled Action	Post-Approval
Upgrade and expansion of existing Yaringa Boat Harbour	2011/6014	Controlled Action	Post-Approval
VIC Offshore Windfarm	2021/8966	Controlled Action	Assessment Approach
VICP61 2D Marine Seismic Survey	2008/4075	Controlled Action	Completed
Victorian Desalination Project, Bass Coast	2008/3948	Controlled Action	Post-Approval
Western Plains wind farm	2010/5712	Controlled Action	Assessment Approach
White Rock Wind Farm	2003/986	Controlled Action	Completed
Wind Farm Construction	2000/12	Controlled Action	Post-Approval
Wind Turbines	2001/439	Controlled Action	Completed
Yolla Gas Field (TRL1) Development	2001/321	Controlled Action	Post-Approval
Not controlled action			
2004/2005 drilling program for exploration and production (VIC 01-06, 09-11, 16, 18 & 19 and VIC/RL	2003/1282	Not Controlled Action	Completed
2D seismic survey, Petroleum Exploration Permit Area T/36P	2004/1787	Not Controlled Action	Completed
2D seismic Survey in VIC/P55, VIC/RL2 and VIC/P41	2004/1876	Not Controlled Action	Completed
accomodation units and associatedadministration and recreational facilities	2001/430	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Airey Inlet water reclamation plant to Anglesea sewerage system	2006/2539	Not Controlled Action	Completed
Allendale wind farm	2007/3549	Not Controlled Action	Completed
Alteration of Grass Maintenance Regime within Powling St Wetlands	2012/6527	Not Controlled Action	Completed
Amrit-1 exploration well	2004/1572	Not Controlled Action	Completed
Angas and Galloway Exploration Wells VIC/P39(v)	2005/2330	Not Controlled Action	Completed
Anglesea Mine South Wall Vegetation removal, Anglesea, Vic	2017/8060	Not Controlled Action	Completed
Apollo Bay Water Storage Basin, VIC	2012/6484	Not Controlled Action	Completed
Aquacullture facility for rainbow trout and yabbies and recreational facilities	2002/822	Not Controlled Action	Completed
Barwon Heads Rd gas pipeline installation	2006/2769	Not Controlled Action	Completed
Barwon Heads Stormwater Outfall upgrade, Victoria	2016/7650	Not Controlled Action	Completed
Barwon River Parkland Initiative, Taits Point, Stages 1 and 2	2010/5437	Not Controlled Action	Completed
Basker-Manta-Gummy Oil Development	2011/6052	Not Controlled Action	Completed
Basker-Manta Oil Field Development	2005/2026	Not Controlled Action	Completed
Bass Basin - Pee Jay-1 - Drilling Program	2007/3908	Not Controlled Action	Completed
Beardie-1 Field wildcat oil well	2001/505	Not Controlled Action	Completed
Biodiversity Impacts Audit	2011/6191	Not Controlled Action	Completed
Bluff Heights Estate Stages 2 to 4	2003/1047	Not Controlled Action	Completed
Boneo Park Equestrian Centre	2008/4639	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Capture of Juvenile Tasmanian Devils for Conservation Purposes	2007/3261	Not Controlled Action	Completed
Capture of Tasmanian Devils from Disease-Free Areas	2007/3883	Not Controlled Action	Completed
CO2 geosequestration - Otway Basin Pilot Project	2006/2699	Not Controlled Action	Completed
Communications tower extension	2003/1099	Not Controlled Action	Completed
Construct a Recycled Water Pipeline from Somers Treatment Plant to Blue Scope S	2009/4982	Not Controlled Action	Completed
Construction and operation of Barwon Water biosolids treatment facility	2008/4345	Not Controlled Action	Completed
Construction of a Dwelling	2011/6160	Not Controlled Action	Completed
Construction of a flexi mat boat ramp	2011/5838	Not Controlled Action	Completed
Construction of an ocean access boat ramp at Bastion Point	2004/1407	Not Controlled Action	Completed
Construction of Barwon Heads Bridge	2005/2375	Not Controlled Action	Completed
Construction of distributor road Leeds Parade to Escort Way	2004/1379	Not Controlled Action	Completed
Construction of Infrastructure to Extract, Treat & Transfer Groundwater to Wurde	2008/4104	Not Controlled Action	Completed
Construction of Overtaking Lanes on Great Ocean Rd	2008/4044	Not Controlled Action	Completed
construction of pump station for pump diversion from the Barham River	2003/1242	Not Controlled Action	Completed
Construction of the Edgars Road Extension, from Childs Road, Lalor to Cooper Street, Epping	2003/1135	Not Controlled Action	Completed
Cowes Primary School Gymnasium	2020/8683	Not Controlled Action	Completed
d'Entrecasteaux sites in Tasmania	2006/2618	Not Controlled Action	Completed
Development of Kipper gas field within Vic/L3, Vic/L4 Vic/RL2	2005/2484	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Development of Pt Nepean Quarantine Station (former) National Centre for Coasts and Climate	2008/4653	Not Controlled Action	Completed
development of retirement resort	2004/1828	Not Controlled Action	Completed
Development of Turrum Oil Field and associated infrastructure	2003/1204	Not Controlled Action	Completed
Divestment of Norris Barracks	2003/963	Not Controlled Action	Completed
Drilling and side track completion at Baleen gas production well in Production Licence area VIC/L21	2004/1535	Not Controlled Action	Completed
Drilling of 'Culverin' oil exploration well, permit VIC/P56	2005/2279	Not Controlled Action	Completed
Drilling of Callister-1 exploration well in VIC/P51	2004/1633	Not Controlled Action	Completed
Drilling of Scallop-1 Exploration Well	2003/917	Not Controlled Action	Completed
East Pilchard exploration well	2001/137	Not Controlled Action	Completed
Eco-Tourism Development	2001/442	Not Controlled Action	Completed
Ecotourism Facility	2007/3322	Not Controlled Action	Completed
Eight Mile Creek Drainage Works, Peacocks Road, Eight Mile Creek, SA	2014/7170	Not Controlled Action	Completed
Enterprise 1 Exploration Drilling Program, near Port Campbell, Vic	2019/8438	Not Controlled Action	Completed
Establishment of a 6 turbine windfarm near Wonthaggi	2002/820	Not Controlled Action	Completed
Exploration drilling for liquid/gaseous hydrocarbons	2004/1681	Not Controlled Action	Completed
Exploration Drilling Well Trefoil-1	2003/1058	Not Controlled Action	Completed
Extension of Mountain View basalt quarry by 113 hectares (stage one)	2004/1591	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Fabrication and Spooling of Pipe Strings at Crib Point	2008/4127	Not Controlled Action	Completed
Ferry Service Infrastructure Development	2001/269	Not Controlled Action	Completed
Flinders Backlog Sewer Project	2005/2275	Not Controlled Action	Completed
Gas Field Development	2006/2635	Not Controlled Action	Completed
Gas Fields Development	2011/5879	Not Controlled Action	Completed
Gas Pipeline Installation	2005/2495	Not Controlled Action	Completed
Geelong Bypass Sections 1 & 2	2005/2097	Not Controlled Action	Completed
Gippsland Basin Seismic Programme	2004/1866	Not Controlled Action	Completed
Gleneig Spiny Crayfish Habitat Rehabilitation	2011/6164	Not Controlled Action	Completed
Golflinks Road Residential Development & Water Storage Facility at Barwon Heads	2004/1793	Not Controlled Action	Completed
Grevillea infecunda tip cuttings and soil samples	2005/1979	Not Controlled Action	Completed
Halladale and Speculant Gas Pipeline Project, North of Port Campbell, Vic	2015/7551	Not Controlled Action	Completed
Hemingway1/Oil Exploration	2001/177	Not Controlled Action	Completed
Henry-1 Exploration Well, Petroleum Permit Area VIC/P44	2005/2147	Not Controlled Action	Completed
Huxley Hill Wind Farm expansion	2005/2499	Not Controlled Action	Completed
Huxley Hill Wind Farm Expansion	2002/570	Not Controlled Action	Completed
Illuka Residential Estate	2007/3224	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Installation of a 35 metre telecommunications facility at Jirrahlinga Animal San	2003/1151	Not Controlled Action	Completed
Installation of optic fibre cable from Inverloch, Victoria to Stanley, Tasmania	2002/906	Not Controlled Action	Completed
Kelly Swamp Boardwalk Construction	2010/5371	Not Controlled Action	Completed
Kipper Tuna Turrum Project Maintenance Dredging	2010/5430	Not Controlled Action	Completed
Kongorong Wind Farm	2002/568	Not Controlled Action	Completed
Laslett Wind Farm	2007/3550	Not Controlled Action	Completed
Longtom-3 Gas Appraisal Well, VIC/P54	2005/2494	Not Controlled Action	Completed
Longtom Gas Pipeline Development, VIC/P54	2006/3072	Not Controlled Action	Completed
Lot 5 Pelican Point Road, Pelican Point SA - Proposed New Dwelling	2021/9011	Not Controlled Action	Completed
Maintenance and priority works to heritage buildings at Point Nepean Quarantine	2006/3151	Not Controlled Action	Completed
Maintenance dredging of Yaringa Channel	2004/1360	Not Controlled Action	Completed
Maintenance Dredging South Channel 2012	2011/6198	Not Controlled Action	Completed
Maintenance of Access Track and Weed Removal	2009/4973	Not Controlled Action	Completed
Maintenance works at Barwon Heads Bridge	2003/1199	Not Controlled Action	Completed
Marine and Freshwater Resources Institute (MAFRI) Facility	2000/121	Not Controlled Action	Completed
Marlin-Snapper Gas Pipeline Project	2006/3197	Not Controlled Action	Completed
Melville 1 Oil Exploration Well	2001/167	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Merricks Beach Backlog Sewer Project	2010/5300	Not Controlled Action	Completed
Millwood Road Gravel Quarry	2002/602	Not Controlled Action	Completed
Minerva Cut Back Project, Vic	2017/8036	Not Controlled Action	Completed
Newfield wind farm	2007/3226	Not Controlled Action	Completed
Newhaven Yacht Squadron marina extension	2004/1450	Not Controlled Action	Completed
New Water Infrastructure Upgrade, Grassy Dam, King Island	2013/6882	Not Controlled Action	Completed
Nirranda South Wind Farm Pty Ltd	2002/763	Not Controlled Action	Completed
Northright-1 Exploration Well	2001/209	Not Controlled Action	Completed
Ocean Grove rising main 2 upgrade	2009/4978	Not Controlled Action	Completed
Ocean Grove Rising Main 2 Upgrade (OGRM2) - East Section & River Crossing	2010/5508	Not Controlled Action	Completed
Oceanlinx South Australia 1mW Greenwave Project	2012/6528	Not Controlled Action	Completed
Offshore exploration drilling within permit area VIC/P 37(v)	2004/1466	Not Controlled Action	Completed
Offshore Petroleum Exploration	2001/289	Not Controlled Action	Completed
Offshore Seismic Survey	2001/498	Not Controlled Action	Completed
Optic fibre cable installation - San Remo to Cowes	2005/2386	Not Controlled Action	Completed
Piccaninnie Ponds flow path restoration project, SA	2013/6711	Not Controlled Action	Completed
Pipeline easement regrowth removal	2011/5817	Not Controlled Action	Completed
Point Nepean Quarantine Station (former)/Restoration of Medical Superintendent's	2006/3149	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Port Campbell Headland Walking Trail Realignment	2012/6676	Not Controlled Action	Completed
Portland Landfill Borehole Installation, Vic	2017/7886	Not Controlled Action	Completed
Port Phillip Channel Deepening Project - Trial Dredge Program	2005/2164	Not Controlled Action	Completed
Proposed replacement of existing road culvert	2013/7077	Not Controlled Action	Completed
Queenscliff Harbour Redevelopment	2004/1352	Not Controlled Action	Completed
Railway Bridge (H0151) Partial Demolition, Merri River	2010/5534	Not Controlled Action	Completed
Redevelopment Project to Upgrade and Extend the Portland Trawler Wharf	2008/4317	Not Controlled Action	Completed
Rehabilitation of Lake Connewarre State Game Reserve	2002/708	Not Controlled Action	Completed
Remedial Works to the Swan Island Bridge	2003/1129	Not Controlled Action	Completed
Remote power generation project	2005/2287	Not Controlled Action	Completed
Replacement of sewer pipelines	2002/623	Not Controlled Action	Completed
Residential/Resort/Golf Course development	2002/907	Not Controlled Action	Completed
Residential Development, 409 The Esplanade, St Leonards	2006/2950	Not Controlled Action	Completed
Residential Dwelling	2004/1896	Not Controlled Action	Completed
Ryan Corner Wind Farm	2005/2142	Not Controlled Action	Completed
Saline Recharge of meromictic Lake Fidler	2004/1334	Not Controlled Action	Completed
Sole-2 appraisal gas well, VIC/RL3	2002/636	Not Controlled Action	Completed
Sole gas field development	2003/937	Not Controlled Action	Completed
Sparrovale Wetland stormwater management, Armstrong Creek and Charlemont, VIC	2018/8375	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Spikey Beach 1, West Triton Drilling Program, Bass Basin Permit T/38P	2007/3914	Not Controlled Action	Completed
Stage 1 residential subdivision, Anna Catherine Drive	2005/1992	Not Controlled Action	Completed
St Quentin Consulting Pty Ltd /Residential development/305 Great Ocean Road, Jan Juc/VIC/Development	2014/7184	Not Controlled Action	Completed
Telstra optic fibre cable across Bass Strait - Sub bottom profiler Surve	2002/779	Not Controlled Action	Completed
Tenby Point Sewerage Pipeline	2001/406	Not Controlled Action	Completed
To construct a shared trail within the Arthurs Seat Road, road reserve south side from Mornington Fl	2004/1565	Not Controlled Action	Completed
Torquay Sewerage Strategy - pipe replacement between Torquay and the Black Rock	2004/1704	Not Controlled Action	Completed
Track construction - Great Ocean Walk	2002/793	Not Controlled Action	Completed
Transfer of 90ha Point Nepean Quarantine Station from Commonwealth to Victorian	2008/4521	Not Controlled Action	Completed
Turrum Phase 2 Development Project	2008/4191	Not Controlled Action	Completed
Upgrade and Repairs to Flinders Pier	2008/4331	Not Controlled Action	Completed
Upgrade of existing access track	2011/5933	Not Controlled Action	Completed
Upgrade of the existing Thornhill St Sewer Pump Station	2010/5618	Not Controlled Action	Completed
Venus Bay Outfall Extension	2004/1555	Not Controlled Action	Completed
VIC-P44 Stage 2 Gas Field Development	2007/3767	Not Controlled Action	Completed
Victorian Generator Project	2005/1984	Not Controlled Action	Completed
Wastewater Treatment System Upgrade	2004/1420	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
West Triton Drilling Program - Gippsland Basin	2007/3915	Not Controlled Action	Completed
West Triton Drilling Program - Otway Basin	2007/3909	Not Controlled Action	Completed
Wind Farm	2002/691	Not Controlled Action	Completed
Wind Farm Construction and Operation	2001/471	Not Controlled Action	Completed
Wooralla Drive pump station, pipeline and associated works	2005/2450	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Moonlight Head' 3D seismic survey, VIC/P38(V), VIC/P43 and VIC/RL8	2005/2236	Not Controlled Action (Particular Manner)	Post-Approval
2D & 3D seismic survey T/39P	2005/2237	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey	2005/2295	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey, EPP33	2004/1794	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey in Permit Areas T/32P and T/33P	2002/845	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Aquisition Survey	2008/4041	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/4066	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/3962	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/4131	Not Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		(Particular Manner)	
2D Seismic Survey	2003/1214	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey, Petroleum Exploration Permit Area EPP27	2006/2776	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey in the Sole gas field and adjacent acreage in the Gippsland Basin (VIC RL/3 & VIC/	2002/871	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey in VIC/P50 and VIC/P46	2004/1810	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey Permit Area VIC/P49	2006/2943	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey Program in Bass Strait	2008/4040	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey VIC/P50	2005/2313	Not Controlled Action (Particular Manner)	Post-Approval
2D Siesmic Marine Survey	2008/4074	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey near King Island	2004/1461	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey within Torquay Sub-basin off sthn Victoria	2012/6256	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic program VIC/P38(v), VIC/P43 and VIC/RL8	2003/1137	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
3D Seismic Survey	2008/4528	Not Controlled Action (Particular Manner)	Post-Approval
Apache 3D seismic exploration survey	2006/3146	Not Controlled Action (Particular Manner)	Post-Approval
Aroo Chappell 3D seismic survey	2010/5701	Not Controlled Action (Particular Manner)	Post-Approval
Astrolabe 3D Marine Seismic Survey	2011/6048	Not Controlled Action (Particular Manner)	Post-Approval
Barwon Heads Rising Main No.11 Sewerage Pipe Upgrade	2008/4091	Not Controlled Action (Particular Manner)	Post-Approval
Bass Basin 2D and 3D seismic surveys (T/38P & T/37P)	2007/3650	Not Controlled Action (Particular Manner)	Post-Approval
Benbows Paddock residential development, Cape Bridgewater	2007/3247	Not Controlled Action (Particular Manner)	Post-Approval
Bernoulli 3D Seismic Survey	2006/3053	Not Controlled Action (Particular Manner)	Post-Approval
BHPBilliton Otway 3D Seismic Survey	2007/3443	Not Controlled Action (Particular Manner)	Post-Approval
Bitumen Storage Facility	2007/3676	Not Controlled Action (Particular Manner)	Post-Approval
Bream 3D seismic survey	2006/2556	Not Controlled Action (Particular Manner)	Post-Approval
Collection of cast bull kelp	2002/813	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
construction of a 14km , 33kV distribution line, including connection to the Lake Bonney Central win	2003/1108	Not Controlled Action (Particular Manner)	Post-Approval
Construction of bridge across Barwon River	2006/2947	Not Controlled Action (Particular Manner)	Post-Approval
Construction of wharf	2003/1050	Not Controlled Action (Particular Manner)	Post-Approval
Construct private dwelling	2008/4234	Not Controlled Action (Particular Manner)	Post-Approval
Construct single dwelling	2008/4504	Not Controlled Action (Particular Manner)	Post-Approval
Controlled Burn, Understorey Clearance and Removal of UXO	2003/1030	Not Controlled Action (Particular Manner)	Post-Approval
Dalrymple 3D Seismic Survey	2010/5680	Not Controlled Action (Particular Manner)	Post-Approval
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval
development of retirement village, Bellarine Lakes Golf Course, Bellarine Hwy	2006/3015	Not Controlled Action (Particular Manner)	Post-Approval
Drainage, Trenching & Cable Laying as Part of the Regional Fast Rail Project	2003/1133	Not Controlled Action (Particular Manner)	Post-Approval
Drill and Profile Exploration Well Somerset 1, License Area T34P	2009/5037	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Eden Breakwater Wharf extension, NSW	2015/7582	Not Controlled Action (Particular Manner)	Post-Approval
Eden Breakwater Wharf Extension, NSW	2016/7828	Not Controlled Action (Particular Manner)	Completed
Enterprise Three-dimensional Transition Zone Seismic Survey, Victoria	2016/7800	Not Controlled Action (Particular Manner)	Post-Approval
Exploration drilling of the Craigow-1 and Tolpuddle-1 wells	2010/5725	Not Controlled Action (Particular Manner)	Post-Approval
Fuelbreak construction	2009/4915	Not Controlled Action (Particular Manner)	Post-Approval
Gas Pipeline	2000/20	Not Controlled Action (Particular Manner)	Post-Approval
Geelong Bypass Section 3	2005/2099	Not Controlled Action (Particular Manner)	Post-Approval
Geographe-A gas exploration well	2000/82	Not Controlled Action (Particular Manner)	Post-Approval
Gippsland 2D Marine Seismic Survey - VIC/P-63, VIC/P-64 and T/46P	2009/5241	Not Controlled Action (Particular Manner)	Post-Approval
Golden Beach gas field development	2003/1031	Not Controlled Action (Particular Manner)	Post-Approval
Granville Wind Farm, TAS	2012/6585	Not Controlled Action (Particular Manner)	Post-Approval
Hydrocarbon exploration wells	2003/1062	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
Inspection of project vessels for presence of invasive marine pests in Commonwealth waters off Victo	2012/6362	Not Controlled Action (Particular Manner)	Post-Approval
Labatt 3D Seismic Survey T/47P Bass Strait	2007/3759	Not Controlled Action (Particular Manner)	Post-Approval
La Bella 3D Marine Seismic Survey, Otway Basin, VIC	2012/6683	Not Controlled Action (Particular Manner)	Post-Approval
Lakes Oil 3D Seismic Survey	2002/768	Not Controlled Action (Particular Manner)	Post-Approval
Longtom-5 Offshore Production Drilling (Vic/L29), VIC	2012/6498	Not Controlled Action (Particular Manner)	Post-Approval
Longtom South -1 Exploration Drilling	2011/6217	Not Controlled Action (Particular Manner)	Post-Approval
Luxury Cruise on the Gordon River, Tasmanian Wilderness PT 2	2006/3044	Not Controlled Action (Particular Manner)	Post-Approval
Luxury Cruise on the Gordon River, Tasmanian Wilderness WHA	2004/1846	Not Controlled Action (Particular Manner)	Post-Approval
Maintenance Dredging Program	2009/4953	Not Controlled Action (Particular Manner)	Post-Approval
Maintenance Dredging Program 2012-21 in Port of Melbourne	2012/6332	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Marine Farming Expansion, Macquarie Harbour, TAS	2012/6406	Not Controlled Action (Particular Manner)	Post-Approval
Non-exclusive 3-D Marine Seismic Survey, Bass Strait	2002/775	Not Controlled Action (Particular Manner)	Post-Approval
Northern Fields 3D Seismic Survey	2001/140	Not Controlled Action (Particular Manner)	Post-Approval
Origin Energy Silvereye-1 Exploration Drilling Programme	2010/5702	Not Controlled Action (Particular Manner)	Post-Approval
OTE10 2D Marine Seismic Survey	2009/5223	Not Controlled Action (Particular Manner)	Post-Approval
Otway Basin Exploration Drilling Campaign, Vic	2011/6125	Not Controlled Action (Particular Manner)	Post-Approval
Pelican 3D Marine Seismic Survey, Gippsland Basin, Vic	2017/8097	Not Controlled Action (Particular Manner)	Post-Approval
Remove silt build up on existing swales around the perimeter of the Three Hummo	2010/5676	Not Controlled Action (Particular Manner)	Post-Approval
Residential Development and Associated Infrastructure at Port Fairy	2012/6687	Not Controlled Action (Particular Manner)	Post-Approval
Rockhopper-1 and Trefoil-2 Exploration Drilling in Permit Area T/18P	2009/4776	Not Controlled Action (Particular Manner)	Post-Approval
Santos 2D Seismic Survey VIC/P44 & VIC/P51	2003/1213	Not Controlled Action (Particular Manner)	Post-Approval
Santos Otway 3d Seismic VIC/P44	2007/3367	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Schomberg 3D Marine Seismic survey	2007/3868	Not Controlled Action (Particular Manner)	Post-Approval
SEA Gas Project transmission pipeline	2001/513	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Exploration in Permit VIC/P41	2001/267	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Survey	2001/206	Not Controlled Action (Particular Manner)	Post-Approval
Seismic survey, Gippsland Basin	2001/525	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Survey in Petroleum Permit Area EPP27	2002/648	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Survey VIC-P46	2002/826	Not Controlled Action (Particular Manner)	Post-Approval
Shaw River Power Station construct gas pipeline and associated infrastructure	2009/5089	Not Controlled Action (Particular Manner)	Post-Approval
Shaw River Power Station Project - Water Supply Pipeline	2009/5091	Not Controlled Action (Particular Manner)	Post-Approval
Shearwater 2D and 3D marine seismic survey	2005/2180	Not Controlled Action (Particular Manner)	Post-Approval
Silvereye 3D Seismic Survey	2007/3551	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Southern Flanks 2D Marine Seismic Survey	2010/5288	Not Controlled Action (Particular Manner)	Post-Approval
Southern Gas Pipeline Project	2002/619	Not Controlled Action (Particular Manner)	Post-Approval
Southern Margins 3D Seismic Survey VIC/P55	2007/3780	Not Controlled Action (Particular Manner)	Post-Approval
Southern Margins T/35P and T/36P 3D Seismic Surveys	2007/3817	Not Controlled Action (Particular Manner)	Post-Approval
Speculant 3D Transition Zone Seismic Survey	2010/5558	Not Controlled Action (Particular Manner)	Post-Approval
Strike Oil NL Seismic Surveys	2000/107	Not Controlled Action (Particular Manner)	Post-Approval
Surface Geochemical Exploration Program, TAS	2010/5780	Not Controlled Action (Particular Manner)	Post-Approval
Tap Oil Ltd Molson 2D Seismic Survey T47P	2008/3967	Not Controlled Action (Particular Manner)	Post-Approval
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, Vic	2012/6565	Not Controlled Action (Particular Manner)	Post-Approval
Three Capes Track	2011/6200	Not Controlled Action (Particular Manner)	Post-Approval
Thylacine-A Exploration Well	2000/81	Not Controlled Action (Particular Manner)	Post-Approval
Torquay Sub-basin (VIC/P62) OTE12-3D Seismic Survey	2012/6655	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Tuskfish 3D Seismic Survey, Bass Strait	2002/864	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5700	Not Controlled Action (Particular Manner)	Post-Approval
Upgrade of Arthur River Road	2003/930	Not Controlled Action (Particular Manner)	Post-Approval
Vegetation clearance and residential subdivision near Mt Gambier	2004/1370	Not Controlled Action (Particular Manner)	Post-Approval
Vic/P37(v) and Vic/P44 3D marine seismic survey	2003/1102	Not Controlled Action (Particular Manner)	Post-Approval
VIC P44 Gas Exploration Wells	2002/662	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 2D seismic survey	2002/811	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 3D seismic survey	2002/799	Not Controlled Action (Particular Manner)	Post-Approval
West Seahorse Oil Development Project, Commonwealth waters offshore Victoria	2013/6973	Not Controlled Action (Particular Manner)	Post-Approval
Wolseley 3D seismic acquisition survey	2010/5703	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
2D & 3D Seismic Surveys - Permit Area - VIC/P50	2008/4517	Referral Decision	Completed
2D Seismic Survey	2008/3978	Referral Decision	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
3D Marine Seismic Survey	2011/6156	Referral Decision	Completed
3D Seismic Survey	2008/4014	Referral Decision	Completed
8 Lot Industrial Subdivision	2008/4527	Referral Decision	Completed
All actions taken in response to the current severe bushfires in Victoria.	2009/4787	Referral Decision	Completed
Alteration Reconstruction Restoration and Repairs to Buildings	2008/4179	Referral Decision	Completed
Beardie-1 Field wildcat oil well	2001/469	Referral Decision	Completed
Darymple 3D Seismic Survey, Petroleum Exploration Permit T/41P	2010/5322	Referral Decision	Completed
Holloman 2010 Vic/P60 3D Seismic Acquisition Survey Program	2009/5251	Referral Decision	Completed
Kelly Channel Discharge, Macquarie Harbour, Tasmania	2017/8057	Referral Decision	Completed
Land clearing for stock grazing	2005/2176	Referral Decision	Completed
Longtom 5 Offshore Production Drilling (VIC/L29)	2012/6404	Referral Decision	Completed
Longtom-5 Offshore Production Drilling (Vic/L29)	2012/6413	Referral Decision	Completed
Offshore Tidal Energy Facility and Submarine Cable	2008/4480	Referral Decision	Referral Publication
Portland Wave Energy Project	2008/3946	Referral Decision	Completed
Residential Development Elizabeth Avenue, Rosebud West, VIC	2015/7603	Referral Decision	Completed
Shark 3D Seismic Survey	2007/3294	Referral Decision	Completed
Stanton 3D Marine Seismic Survey	2013/6764	Referral Decision	Completed
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, VIC	2012/6545	Referral Decision	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
Upgrade of Services Infrastructure Point Nepean Quarantine Station	2008/4591	Referral Decision	Completed
VICP61 2D Marine Seismic Survey	2008/3975	Referral Decision	Completed
Wind Farm	2001/139	Referral Decision	Completed
Wolseley 3D Seismic Acquisition Survey in Permit T/32P	2010/5291	Referral Decision	Completed
Works to the buildings and surrounds at the former Point Nepean Quarantine Stati	2008/4156	Referral Decision	Completed

Key Ecological Features

[Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Big Horseshoe Canyon	South-east
Bonney Coast Upwelling	South-east
Canyons on the eastern continental slope	Temperate east
Seamounts South and east of Tasmania	South-east
Upwelling East of Eden	South-east
West Tasmania Canyons	South-east

Biologically Important Areas

Scientific Name	Behaviour	Presence
Dolphins		
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur
Seabirds		
Ardenna carneipes Flesh-footed Shearwater [82404]	Foraging	Known to occur
Ardenna grisea Sooty Shearwater [82651]	Breeding	Known to occur
Ardenna grisea Sooty Shearwater [82651]	Foraging	Likely to occur

Scientific Name	Behaviour	Presence
Ardenna grisea Sooty Shearwater [82651]	Foraging	Known to occur
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Breeding	Known to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Likely to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur
Eudyptula minor Little Penguin [1085]	Breeding	Known to occur
Eudyptula minor Little Penguin [1085]	Foraging	Known to occur
Macronectes giganteus Southern Giant Petrel [1060]	Foraging	Known to occur
Macronectes halli Northern Giant Petrel [1061]	Foraging	Known to occur
Morus serrator Australasian Gannet [1020]	Aggregation	Known to occur
Morus serrator Australasian Gannet [1020]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Oceanites oceanites Wilsons Storm Petrel [1034]	Migration	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Breeding	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Breeding	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Breeding	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Likely to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Known to occur
Procellaria parkinsoni Black Petrel [1048]	Foraging	Likely to occur
Pterodroma macroptera Great-winged Petrel [1035]	Foraging	Likely to occur
Pterodroma mollis Soft-plumaged Petrel [1036]	Breeding	Known to occur
Pterodroma mollis Soft-plumaged Petrel [1036]	Foraging	Known to occur
Sterna striata White-fronted Tern [799]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Breeding	Known to occur

Scientific Name	Behaviour	Presence
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche cauta steadi White-capped Albatross [82344]	Foraging	Known to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging likely	Likely to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Likely to occur
Thalasseus bergii Crested Tern [83000]	Foraging	Likely to occur
Seals		
Neophoca cinerea Australian Sea Lion [22]	Foraging (male)	Known to occur
Neophoca cinerea Australian Sea Lion [22]	Foraging (male and female)	Known to occur
Sharks		
Carcharias taurus Grey Nurse Shark [64469]	Foraging	Known to occur
Carcharias taurus Grey Nurse Shark [64469]	Migration	Known to occur
Carcharodon carcharias White Shark [64470]	Breeding (nursery area)	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur

Scientific Name	Behaviour	Presence
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (abundant food source)	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur
Eubalaena australis Southern Right Whale [40]	Aggregation	Known to occur
Eubalaena australis Southern Right Whale [40]	Breeding likely	Known to occur
Eubalaena australis Southern Right Whale [40]	Connecting habitat	Known to occur
Eubalaena australis Southern Right Whale [40]	Known core range	Known to occur

Scientific Name	Behaviour	Presence
Eubalaena australis Southern Right Whale [40]	Migration and resting on migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Foraging	Known to occur
Physeter macrocephalus Sperm Whale [59]	Foraging likely (abundant food source)	Known to occur

Bioregional Assessments

SubRegion	BioRegion	Website
Gippsland	Gippsland Basin	BA website

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- -Office of Environment and Heritage, New South Wales
- -Department of Environment and Primary Industries, Victoria
- -Department of Primary Industries, Parks, Water and Environment, Tasmania
- -Department of Environment, Water and Natural Resources, South Australia
- -Department of Land and Resource Management, Northern Territory
- -Department of Environmental and Heritage Protection, Queensland
- -Department of Parks and Wildlife, Western Australia
- -Environment and Planning Directorate, ACT
- -Birdlife Australia
- -Australian Bird and Bat Banding Scheme
- -Australian National Wildlife Collection
- -Natural history museums of Australia
- -Museum Victoria
- -Australian Museum
- -South Australian Museum
- -Queensland Museum
- -Online Zoological Collections of Australian Museums
- -Queensland Herbarium
- -National Herbarium of NSW
- -Royal Botanic Gardens and National Herbarium of Victoria
- -Tasmanian Herbarium
- -State Herbarium of South Australia
- -Northern Territory Herbarium
- -Western Australian Herbarium
- -Australian National Herbarium, Canberra
- -University of New England
- -Ocean Biogeographic Information System
- -Australian Government, Department of Defence
- Forestry Corporation, NSW
- -Geoscience Australia
- -CSIRO
- -Australian Tropical Herbarium, Cairns
- -eBird Australia
- -Australian Government – Australian Antarctic Data Centre
- -Museum and Art Gallery of the Northern Territory
- -Australian Government National Environmental Science Program
- -Australian Institute of Marine Science
- -Reef Life Survey Australia
- -American Museum of Natural History
- -Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
- -Tasmanian Museum and Art Gallery, Hobart, Tasmania
- -Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

APPENDIX E

Atlas of Living Australia Cephalopod Search

Operational Area					
Species Name	Class	Order	Family	Genus	Vernacular Name
Scheltemaia bassensis	Aplacophora		Pruvotinidae	Scheltemaia	
Centrocardita rosulenta	Bivalvia	Carditida	Carditidae	Centrocardita	Cockle
Pratulum thetidis	Bivalvia	Cardiida	Cardiidae	Pratulum	Thetis Cockle
Limopsis (Glycilima) penelevis	Bivalvia	Arcida	Limopsidae	Limopsis	Bivalve
Tucetona flabellata	Bivalvia	Arcida	Glycymerididae	Tucetona	Flabellated Dog Cockle
Thracidora arenosa	Bivalvia		Thraciidae	Thracidora	Bivalve
Solemya (Austrosolemya) australis	Bivalvia	Solemyida	Solemyidae	Solemya	Date Shell
Gregariella barbata	Bivalvia	Mytilida	Mytilidae	Gregariella	Hairy Three-area Mussel
Glycymeris (Glycymeris) striatularis	Bivalvia	Arcida	Glycymerididae	Glycymeris	Dog Cockle
Talochlamys pulleineana	Bivalvia	Pectinida	Pectinidae	Talochlamys	Scallop
Lima (Lima) nimbifer	Bivalvia	Limida	Limidae	Lima	File Clam
Limopsis (Versipella) tenisoni	Bivalvia	Arcida	Limopsidae	Limopsis	Tenison's False Dog Cockle
Talabrica aurora	Bivalvia	Carditida	Crassatellidae	Talabrica	Cockle
Barbatia (Barbatia) pistachia	Bivalvia	Arcida	Arcidae	Barbatia	Noah's Ark Shell
Electroma papilionacea	Bivalvia	Ostreida	Pteriidae	Electroma	Wing Shell
Epicodakia consettiana	Bivalvia	Lucinida	Lucinidae	Epicodakia	Cockle
Cuna delta	Bivalvia	Carditida	Condylocardiidae	Cuna	Bivalve
Pulvinites exempla	Bivalvia	Ostreida	Pulvinitidae	Pulvinites	Bivalve
Austrorossia australis	Cephalopoda	Sepiolida	Sepiolidae	Austrorossia	Dumpling Squid
Nototodarus gouldi	Cephalopoda	Teuthida	Ommastrephidae	Nototodarus	Red Arrow Squid
Architeuthis dux	Cephalopoda	Teuthida	Architeuthidae	Architeuthis	Giant Squid
Mesonychoteuthis hamiltoni	Cephalopoda	Teuthida	Cranchiidae	Mesonychoteuthis	Antarctic Cranch Squid
Sepia cultrata	Cephalopoda	Sepiida	Sepiidae	Sepia	Knifebone Cuttlefish
Lycoteuthis lorigera	Cephalopoda	Teuthida	Lycoteuthidae	Lycoteuthis	Squid
Neorossia leptodons	Cephalopoda	Sepiolida	Sepiolidae	Neorossia	Dumpling Squid
Sepia hedleyi	Cephalopoda	Sepiida	Sepiidae	Sepia	King Cuttlefish
Lepidoteuthis grimaldii	Cephalopoda	Teuthida	Lepidoteuthidae	Lepidoteuthis	Scaled Squid
Onykia loennbergii	Cephalopoda	Teuthida	Onychoteuthidae	Onykia	Hooked Squid
Moroteuthis ingens	Cephalopoda	Teuthida	Onychoteuthididae	Moroteuthis	
Pyroteuthis margaritifera	Cephalopoda	Teuthida	Pyroteuthidae	Pyroteuthis	Squid
Octopus maorum	Cephalopoda	Octopoda	Octopodidae	Octopus	Maori Octopus
Opisthoteuthis persephone	Cephalopoda	Octopoda	Opisthoteuthidae	Opisthoteuthis	Jelly Octopod
Mastigoteuthis cordiformis	Cephalopoda	Teuthida	Mastigoteuthidae	Mastigoteuthis	
Opisthoteuthis pluto	Cephalopoda	Octopoda	Opisthoteuthidae	Opisthoteuthis	Jelly Octopod
Teuthowenia pellucida	Cephalopoda	Teuthida	Cranchiidae	Teuthowenia	Squid
Cupedora extensum	Gastropoda	Stylommatophora	Camaenidae	Cupedora	
Sassia kampyla	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	
Calliostoma (Fautor) legrandi	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Livonia roadnightae	Gastropoda	Hypsogastropoda	Volutidae	Livonia	Volute
Strangesta gawleri	Gastropoda	Stylommatophora	Rhytididae	Strangesta	Gawler Carnivorous Snail
Sassia subdistorta	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Subdistorted Triton
Heliconoides inflatus	Gastropoda	Pteropoda	Limacinidae	Limacina	Shelled Pteropod
Isidorella hainesii	Gastropoda		Planorbidae	Isidorella	Freshwater Snail
Ovaginella ovulum	Gastropoda	Hypsogastropoda	Marginellidae	Ovaginella	Marginella
Cumia mestayerae	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	Whelk
Anatoma tobeyoides	Gastropoda		Anatomidae	Anatoma	Slit Shell
Gazameda tasmanica	Gastropoda	Cerithimorpha	Turritellidae	Gazameda	Screw Shell
Isara glabra	Gastropoda	Hypsogastropoda	Mitridae	Isara	Glabra Mitre

Tenagodus australis	Gastropoda	Cerithimorpha	Siliquariidae	Tenagodus	Australian Worm Shell
Emarginula (Emarginula) candida	Gastropoda		Fissurellidae	Emarginula	Slit Limpet
Dentimitrella menkeana	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Menke's Dove Shell
Theba pisana	Gastropoda	Stylommatophora	Helicidae	Theba	White Italian Snail
Magilaoma penolensis	Gastropoda	Stylommatophora	Punctidae	Magilaoma	Penola Pinhead Snail
Rissoina (Rissoina) gertrudis	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Teinostoma (Callomphala) lucida	Gastropoda	Hypsogastropoda	Tornidae	Teinostoma	Bright Liotia
Rissoina (Rissoina) rhyllensis	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Maoritomella foliacea	Gastropoda	Hypsogastropoda	Borsoniidae	Maoritomella	Turrid Shell
Tritia ephamilla	Gastropoda	Hypsogastropoda	Nassariidae	Tritia	Dog Whelk
Benthoxystus columnarius	Gastropoda	Hypsogastropoda	Muricidae	Benthoxystus	Murex Shell
Calliostoma (Fautor) hedleyi	Gastropoda		Calliostomatidae	Calliostoma	Hedley's Top Shell
Ericusa papillosa	Gastropoda	Hypsogastropoda	Volutidae	Ericusa	Kenyon's Volute
Putilla porcellana	Gastropoda			Putilla	Gastropod
Charisma josephi	Gastropoda		Trochidae	Charisma	Joseph's Charisma
Eunaticina umbilicata	Gastropoda	Hypsogastropoda	Naticidae	Eunaticina	Sand Snail
Cystiscus angasi	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Angas's Margin Shell
Cystiscus connectans	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Anatrophon sarmentosus	Gastropoda	Hypsogastropoda	Muricidae	Anatrophon	Murex Shell
Diacria trispinosa	Gastropoda	Pteropoda	Cavoliniidae	Diacria	Shelled Pteropod
Charonia lampas	Gastropoda	Hypsogastropoda	Charoniidae	Charonia	Red Whelk
Colpospira (Colpospira) runcinata	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Astralium squamiferum	Gastropoda		Turbinidae	Astralium	Star Shell
Dentimargo mayii	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Fax (Scaeofax) molleri	Gastropoda	Hypsogastropoda	Buccinidae	Fax	Whelk
Cadulus vincentianus	Scaphopoda	Gadilida	Gadilidae	Cadulus	Tusk Shell
Entalina dorsicostata	Scaphopoda	Gadilida	Entalinidae	Entalina	Tusk Shell
Laevidentalium erectum	Scaphopoda	Dentaliida	Laevidentaliidae	Laevidentalium	Tusk Shell

EMBA					
Falcidens chiastos	Aplacophora		Chaetodermatidae	Falcidens	
Scheltemaia bassensis	Aplacophora		Pruvotinidae	Scheltemaia	
Scheltemaia mimus	Aplacophora		Pruvotinidae	Scheltemaia	
Tegulaherpia tasmanica	Aplacophora		Lepidomeniidae	Tegulaherpia	Neomenioid Aplacophoran
Claviderma australe	Aplacophora		Prochaetodermatidae	Claviderma	Chaetoderm Aplacophoran
Falcidens lipuros	Aplacophora		Chaetodermatidae	Falcidens	Chaetoderm Aplacophoran
Notomenia clavigera	Aplacophora		Notomeniidae	Notomenia	Neomenioid Aplacophoran
Brachidontes rostratus	Bivalvia	Mytilida	Mytilidae	Brachidontes	Beaked Mussel
Mimachlamys asperrima	Bivalvia	Pectinida	Pectinidae	Mimachlamys	Doughboy
Xenostrobus pulex	Bivalvia	Mytilida	Mytilidae	Xenostrobus	Little Black Horse Mussel
Chioneryx cardioides	Bivalvia	Cardiida	Veneridae	Chioneryx	Heart Venerid
Fulvia (Fulvia) tenuicostata	Bivalvia	Cardiida	Cardiidae	Fulvia	Rackett's Strawberry Cockle
Barbatia (Barbatia) pistachia	Bivalvia	Arcida	Arcidae	Barbatia	Noah's Ark Shell
Neotrigonia margaritacea	Bivalvia	Trigoniida	Trigoniidae	Neotrigonia	Common Brooch Shell
Hiatella australis	Bivalvia	Adapedonta	Hiatellidae	Hiatella	Australian Rock-borer
Pratulum thetidis	Bivalvia	Cardiida	Cardiidae	Pratulum	Thetis Cockle
Lasaea australis	Bivalvia	Cardiida	Lasaeidae	Lasaea	Australian Lasaea
Modiolus areolatus	Bivalvia	Mytilida	Mytilidae	Modiolus	Southern Horse Mussel
Pecten fumatus	Bivalvia	Pectinida	Pectinidae	Pecten	Scallop
Tawera gallinula	Bivalvia	Cardiida	Veneridae	Tawera	Venus Cockle

Nucula (Nucula) pusilla	Bivalvia	Nuculida	Nuculidae	Nucula	Nut Cockle
Glycymeris (Glycymeris) striatularis	Bivalvia	Arcida	Glycymerididae	Glycymeris	Dog Cockle
Katelysia rhytiphora	Bivalvia	Cardiida	Veneridae	Katelysia	Ridged Venus
Callista (Striacallista) diemenensis	Bivalvia	Cardiida	Veneridae	Callista	Tasmanian Venus
Ostrea angasi	Bivalvia	Ostreida	Ostreidae	Ostrea	Stewart Island Oyster
Tucetona flabellata	Bivalvia	Arcida	Glycymerididae	Tucetona	Flabellated Dog Cockle
Purpurocardia bimaculata	Bivalvia	Carditida	Carditidae	Purpurocardia	Cockle
Talochlamys pulleineana	Bivalvia	Pectinida	Pectinidae	Talochlamys	Scallop
Solen vaginoides	Bivalvia	Adapedonta	Solenidae	Solen	Chinaman's Fingernail
Mytilus galloprovincialis	Bivalvia	Mytilida	Mytilidae	Mytilus	Blue Mussel
Centrocardita rosulenta	Bivalvia	Carditida	Carditidae	Centrocardita	Cockle
Anadara (Anadara) trapezia	Bivalvia	Arcida	Arcidae	Anadara	Sydney Cockle
Placamen placidum	Bivalvia	Cardiida	Veneridae	Placamen	Venus Cockle
Purpurocardia amabilis	Bivalvia	Carditida	Carditidae	Purpurocardia	Cockle
Gregariella barbata	Bivalvia	Mytilida	Mytilidae	Gregariella	Hairy Three-area Mussel
Offadesma angasi	Bivalvia		Periplomatidae	Offadesma	Bivalve
Mysella donaciformis	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Limatula (Stabilima) strangei	Bivalvia	Limida	Limidae	Limatula	Strange's File Shell
Austromactra rufescens	Bivalvia	Cardiida	Mactridae	Austromactra	Reddish Trough Shell
Cardita aviculina	Bivalvia	Carditida	Carditidae	Cardita	Cockle
Philobrya rubra	Bivalvia	Arcida	Philobryidae	Philobrya	Bivalve
Hiatula biradiata	Bivalvia	Cardiida	Psammobiidae	Hiatula	Bivalve
Katelysia scalarina	Bivalvia	Cardiida	Veneridae	Katelysia	Stepped Venerid
Electroma virens	Bivalvia	Ostreida	Pteriidae	Electroma	Wing Shell
Acrosterigma cygnorum	Bivalvia	Cardiida	Cardiidae	Acrosterigma	Western Heart Cockle
Ennucula obliqua	Bivalvia	Nuculida	Nuculidae	Ennucula	Subdilecta Nut Shell
Venerupis (Ruditapes) galactites	Bivalvia	Cardiida	Veneridae	Venerupis	Milky Tapes
Ctena tatei	Bivalvia	Lucinida	Lucinidae	Ctena	
Spondylus tenellus	Bivalvia	Pectinida	Spondylidae	Spondylus	Scarlet Thorny Oyster
Amygdalum striatum	Bivalvia	Mytilida	Mytilidae	Amygdalum	Mussel
Irus (Irus) carditoides	Bivalvia	Cardiida	Veneridae	Irus	White Irus
Philobrya crenatulifera	Bivalvia	Arcida	Philobryidae	Philobrya	Bivalve
Chlamydella favus	Bivalvia	Pectinida	Cyclochlamydidae	Chlamydella	Deepwater Scallop
Mactra (Mactra) pura	Bivalvia	Cardiida	Mactridae	Mactra	Pure Trough Shell
Macomona deltoidalis	Bivalvia	Cardiida	Tellinidae	Macomona	Deltoid Tellen
Merisca margaritina	Bivalvia	Cardiida	Tellinidae	Merisca	
Limopsis (Versipella) tenisoni	Bivalvia	Arcida	Limopsidae	Limopsis	Tenison's False Dog Cockle
Arca reticulata	Bivalvia	Arcida	Arcidae	Arca	Reticulated Ark
Pisidium (Euglesa) etheridgei	Bivalvia		Sphaeriidae	Pisidium	Freshwater Cockle
Musculus (Modiolarca) impactus	Bivalvia	Mytilida	Mytilidae	Musculus	Mussel
Donax (Plebidonax) deltoides	Bivalvia	Cardiida	Donacidae	Donax	Pipi
Musculus (Musculus) nanus	Bivalvia	Mytilida	Mytilidae	Musculus	Three Area Mussel
Talabrica aurora	Bivalvia	Carditida	Crassatellidae	Talabrica	Cockle
Eucrassatella kingicola	Bivalvia	Carditida	Crassatellidae	Eucrassatella	King Island Crassatella
Bassina (Callanaitis) disjecta	Bivalvia	Cardiida	Veneridae	Bassina	Wedding Cake Venus
Cyclocardia delicata	Bivalvia	Carditida	Carditidae	Cyclocardia	
Wallucina assimilis	Bivalvia	Lucinida	Lucinidae	Wallucina	Cockle
Theora lubrica	Bivalvia	Cardiida	Semelidae	Theora	Bivalve
Theora lata	Bivalvia	Cardiida	Semelidae	Theora	Bivalve
Brachidontes erosus	Bivalvia	Mytilida	Mytilidae	Brachidontes	Beaked Mussel

Neolepton planiliratum	Bivalvia	Cardiida	Neoleptonidae	Neolepton	Bivalve
Acar squamosa	Bivalvia	Arcida	Arcidae	Acar	Ark Shell
Corbula (Varicorbula) gibba	Bivalvia	Myida	Corbulidae	Corbula	Cockle
Electroma papilionacea	Bivalvia	Ostreida	Pteriidae	Electroma	Wing Shell
Tawera lagopus	Bivalvia	Cardiida	Veneridae	Tawera	Venus Cockle
Saccella crassa	Bivalvia	Nuculanida	Nuculanidae	Saccella	Heavy Nut Shell
Cardiolucina crassilirata	Bivalvia	Lucinida	Lucinidae	Cardiolucina	Densely Striated Lucina
Venerupis (Paphirus) anomala	Bivalvia	Cardiida	Veneridae	Venerupis	Venus Cockle
Gari (Psammobia) livida	Bivalvia	Cardiida	Psammobiidae	Gari	Bivalve
Arthritica semen	Bivalvia	Cardiida	Lasaeidae	Arthritica	
Mactra (Nannomactra) jacksonensis	Bivalvia	Cardiida	Mactridae	Mactra	Clam
Musculus (Modiolarca) cumingianus	Bivalvia	Mytilida	Mytilidae	Musculus	Mussel
Spisula trigonella	Bivalvia	Cardiida	Mactridae	Spisula	Clam
Tellinota albinella	Bivalvia	Cardiida	Tellinidae	Tellinota	Little White Tellen
Gari (Gari) modesta	Bivalvia	Cardiida	Psammobiidae	Gari	Bivalve
Lissarca rhomboidalis	Bivalvia	Arcida	Philobryidae	Lissarca	Rhomboid Lissarca
Bassina (Bassina) pachyphylla	Bivalvia	Cardiida	Veneridae	Bassina	Faint-frilled Venus Shell
Gaimardia tasmanica	Bivalvia		Gaimardiidae	Gaimardia	Bivalve
Notochlamys hexactes	Bivalvia	Pectinida	Pectinidae	Notochlamys	Scallop
Atrina (Atrina) tasmanica	Bivalvia	Ostreida	Pinnidae	Atrina	Tasmanian Razor Shell
Limopsis (Glycilima) penelevis	Bivalvia	Arcida	Limopsidae	Limopsis	Bivalve
Xenostrobus securis	Bivalvia	Mytilida	Mytilidae	Xenostrobus	Little Brown Mussel
Gibbomodiola albicostus	Bivalvia	Mytilida	Mytilidae	Gibbomodiola	Narrow Horse Mussel
Lissarca rubricata	Bivalvia	Arcida	Philobryidae	Lissarca	Bivalve
Mactra (Mactra) australis	Bivalvia	Cardiida	Mactridae	Mactra	Southern Trough Shell
Glycymeris (Glycymeris) grayana	Bivalvia	Arcida	Glycymerididae	Glycymeris	Shiny Dog Cockle
Trichomya hirsuta	Bivalvia	Mytilida	Mytilidae	Trichomya	Hairy Mussel
Glycymeris (Tucetilla) mayi	Bivalvia	Arcida	Glycymerididae	Glycymeris	Dog Cokle
Condylocardia notoaustralis	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Hiatula alba	Bivalvia	Cardiida	Psammobiidae	Hiatula	Bivalve
Notocallista kingii	Bivalvia	Cardiida	Veneridae	Notocallista	King's Venus Shell
Eumarcia fumigata	Bivalvia	Cardiida	Veneridae	Eumarcia	Shining Venus Shell
Vulsella ovata	Bivalvia	Ostreida	Pteriidae	Vulsella	Southern Sponge Finger
Hyridella (Hyridella) narracanensis	Bivalvia	Unionida	Hyriidae	Hyridella	Freshwater Mussel
Cuna delta	Bivalvia	Carditida	Condylocardiidae	Cuna	Bivalve
Paphies (Amesodesma) elongata	Bivalvia	Cardiida	Mesodesmatidae	Paphies	Narrow Wedge Shell
Irus (Irus) crenatus	Bivalvia	Cardiida	Veneridae	Irus	Boring Venus Shell
Cleidothaerus albidus	Bivalvia		Cleidothaeridae	Cleidothaerus	White Cleidothaerus
Purpurocardia purpurata	Bivalvia	Carditida	Carditidae	Purpurocardia	Cockle
Atactodea cuneata	Bivalvia	Cardiida	Mesodesmatidae	Atactodea	Surf Clam
Xenostrobus inconstans	Bivalvia	Mytilida	Mytilidae	Xenostrobus	Variable Brown Mussel
Cuna concentrica	Bivalvia	Carditida	Condylocardiidae	Cuna	Bivalve
Glycymeris (Glycymeris) radians	Bivalvia	Arcida	Glycymerididae	Glycymeris	The Radiating Pectunculus
Vimentum dilectum	Bivalvia	Carditida	Carditidae	Vimentum	Cockle
Gomphina undulosa	Bivalvia	Cardiida	Veneridae	Gomphina	Waved Venus
Scintillula solida	Bivalvia	Cardiida	Galeommatidae	Scintillula	
Dosinia (Bonartemis) victoriae	Bivalvia	Cardiida	Veneridae	Dosinia	Venus Cockle
Cunanax compressa	Bivalvia	Carditida	Condylocardiidae	Cunanax	Bivalve
Barnea (Anchomasa) obturamentum	Bivalvia	Myida	Pholadidae	Barnea	Tongue-shaped Angel's Wing
Semipallium aktinos	Bivalvia	Pectinida	Pectinidae	Semipallium	Atkins' Fan Scallop

Purpurocardia cavatica	Bivalvia	Carditida	Carditidae	Purpurocardia	Cockle
Gaimardia rostellata	Bivalvia		Gaimardiidae	Gaimardia	Bivalve
Dosinia (Asa) caerulea	Bivalvia	Cardiida	Veneridae	Dosinia	Surf Clam
Montacuta semiradiata	Bivalvia	Cardiida	Lasaeidae	Montacuta	Bivalve
Limopsis (Versipella) soboles	Bivalvia	Arcida	Limopsidae	Limopsis	Bivalve
Magallana gigas	Bivalvia	Ostreida	Ostreidae	Magallana	Pacific Oyster
Barnea (Barnea) australasiae	Bivalvia	Myida	Pholadidae	Barnea	Piddock
Reloncavia mactroides	Bivalvia		Cyamiidae	Reloncavia	Bivalve
Lima (Lima) nimbifer	Bivalvia	Limida	Limidae	Lima	File Clam
Myllita (Myllita) tasmanica	Bivalvia	Cardiida	Lasaeidae	Myllita	Tasmanian Myllita
Pseudarcopagia victoriae	Bivalvia	Cardiida	Tellinidae	Pseudarcopagia	Victorian Tellen
Solemya (Austrosolemya) australis	Bivalvia	Solemyida	Solemyidae	Solemya	Date Shell
Poroleda spathula	Bivalvia	Nuculanida	Nuculanidae	Poroleda	Spathula Nut Shell
Mesopeplum fenestratum	Bivalvia	Pectinida	Pectinidae	Mesopeplum	Scallop
Pisidium (Euglesa) tasmanicum	Bivalvia		Sphaeriidae	Pisidium	Freshwater Cockle
Anapella cycladea	Bivalvia	Cardiida	Mesodesmatidae	Anapella	Surf Clam
Equichlamys bifrons	Bivalvia	Pectinida	Pectinidae	Equichlamys	Common Scallop
Myadora complexa	Bivalvia		Myochamidae	Myadora	Bivalve
Atactodea erycinaea	Bivalvia	Cardiida	Mesodesmatidae	Atactodea	Surf Clam
Monia (Monia) zelandica	Bivalvia	Pectinida	Anomiidae	Monia	Jingle Shell
Saccostrea cucullata	Bivalvia	Ostreida	Ostreidae	Saccostrea	
Myrtea botanica	Bivalvia	Lucinida	Lucinidae	Myrtea	
Katelysia peronii	Bivalvia	Cardiida	Veneridae	Katelysia	Peron's Venerid
Corbicula (Corbiculina) australis	Bivalvia	Cardiida	Cyrenidae	Corbicula	Freshwater Cockle
Cunanax subradiata	Bivalvia	Carditida	Condylocardiidae	Cunanax	Bivalve
Condylocuna projecta	Bivalvia	Carditida	Condylocardiidae	Condylocuna	Bivalve
Bathycardita raouli	Bivalvia	Carditida	Carditidae	Bathycardita	Cockle
Sunetta (Sunemeroe) vaginalis	Bivalvia	Cardiida	Veneridae	Sunetta	Venus Cockle
Condylocardia rectangularis	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Dosinia (Asa) crocea	Bivalvia	Cardiida	Veneridae	Dosinia	
Diplodonta (Zemysina) tasmanica	Bivalvia		Ungulinidae	Diplodonta	Tasmanian Globe Shell
Pseudarcopagia botanica	Bivalvia	Cardiida	Tellinidae	Pseudarcopagia	
Laternula (Laternula) tasmanica	Bivalvia		Laternulidae	Laternula	Lantern Shell
Notopaphia grisea	Bivalvia	Cardiida	Veneridae	Notopaphia	Venus Cockle
Musculium (Sphaerinova) tasmanicum	Bivalvia		Sphaeriidae	Musculium	
Gari (Psammobia) kenyoniana	Bivalvia	Cardiida	Psammobiidae	Gari	Bivalve
Corbula tunicata	Bivalvia	Myida	Corbulidae	Corbula	Swollen Little Basket Shell
Veprichlamys perillustris	Bivalvia	Pectinida	Pectinidae	Veprichlamys	Scallop
Corbula smithiana	Bivalvia	Myida	Corbulidae	Corbula	Cockle
Myadora brevis	Bivalvia		Myochamidae	Myadora	Bivalve
Cyamium communis	Bivalvia		Cyamiidae	Cyamium	Bivalve
Felaniella (Zemysia) globularis	Bivalvia		Ungulinidae	Felaniella	Bivalve
Saccella dohrni	Bivalvia	Nuculanida	Nuculanidae	Saccella	Beaked Cockle
Thracia (Eximiothracia) lincolnensis	Bivalvia		Thraciidae	Thracia	Bivalve
Delectopecten fosterianus	Bivalvia	Pectinida	Pectinidae	Delectopecten	Scallop
Propeleda (Propeleda) ensicula	Bivalvia	Nuculanida	Nuculanidae	Propeleda	Sword Nut Shell
Limea (Gemellima) austrina	Bivalvia	Limida	Limidae	Limea	File Clam
Laternula (Laternula) creccina	Bivalvia		Laternulidae	Laternula	Lantern Clam
Zygochlamys delicatula	Bivalvia	Pectinida	Pectinidae	Zygochlamys	Scallop
Tellinides margaritinus	Bivalvia	Cardiida	Tellinidae	Tellinides	Bivalve

Mactrotoma antecedens	Bivalvia	Cardiida	Mactridae	Mactrotoma	Oval-shaped Trough Shell
Condylocardia pectinata	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Divalucina cumingi	Bivalvia	Lucinida	Lucinidae	Divalucina	Cockle
Cuspidaria exarata	Bivalvia		Cuspidariidae	Cuspidaria	Spout-like Cuspidaria
Anomia trigonopsis	Bivalvia	Pectinida	Anomiidae	Anomia	Jingle Shell
Poromya illevis	Bivalvia		Poromyidae	Poromya	Bivalve
Mytilus planulatus	Bivalvia	Mytilida	Mytilidae	Mytilus	Edible Mussel
Solemya (Solemyarina) velesiana	Bivalvia	Solemyida	Solemyidae	Solemya	Date Shell
Musculus (Musculus) alganus	Bivalvia	Mytilida	Mytilidae	Musculus	Mussel
Myochama transversa	Bivalvia		Myochamidae	Myochama	Bivalve
Mysella lactea	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Dosinia (Dosinella) grata	Bivalvia	Cardiida	Veneridae	Dosinia	Venus Cockle
Melliteryx acupuncta	Bivalvia	Cardiida	Lasaeidae	Melliteryx	Bivalve
Condylocardia limaeformis	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Warrana comma	Bivalvia	Carditida	Condylocardiidae	Warrana	Bivalve
Ovacuna atkinsoni	Bivalvia	Carditida	Condylocardiidae	Ovacuna	Bivalve
Lutraria (Psammophila) rhynchaena	Bivalvia	Cardiida	Mactridae	Lutraria	Southern Gaper
Myadora albida	Bivalvia		Myochamidae	Myadora	Bivalve
Philobrya francisensis	Bivalvia	Arcida	Philobryidae	Philobrya	
Cosa pectinata	Bivalvia	Arcida	Philobryidae	Cosa	Bivalve
Hyridella (Hyridella) drapeta	Bivalvia	Unionida	Hyriidae	Hyridella	Freshwater Mussel
Escalima murrayi	Bivalvia	Limida	Limidae	Escalima	File Clam
Carditella jaffaensis	Bivalvia	Carditida	Condylocardiidae	Carditella	Bivalve
Myadora rotundata	Bivalvia		Myochamidae	Myadora	Bivalve
Dosinia crocea	Bivalvia	Cardiida	Veneridae	Dosinia	Venus Cockle
Myllita (Myllita) deshayesi	Bivalvia	Cardiida	Lasaeidae	Myllita	Bivalve
Micropolia ovalis	Bivalvia	Cardiida	Neoleptonidae	Micropolia	Bivalve
Basterotia subalata	Bivalvia	Cardiida	Basterotiidae	Basterotia	Bivalve
Modiolatus victoriae	Bivalvia	Mytilida	Mytilidae	Modiolatus	Victoria's Horse Mussel
Myochama anomioides	Bivalvia		Myochamidae	Myochama	
Panopea australis	Bivalvia	Adapedonta	Hiatellidae	Panopea	Australian Gaper
Velesunio ambiguus	Bivalvia	Unionida	Hyriidae	Velesunio	Southern Mussel
Gouldiopa australis	Bivalvia	Cardiida	Veneridae	Gouldiopa	Venus Cockle
Limopsis (Oblimopa) tenuiradiata	Bivalvia	Arcida	Limopsidae	Limopsis	Dog Cockle
Lucinoma euclia	Bivalvia	Lucinida	Lucinidae	Lucinoma	Bivalve
Neotrigonia gemma	Bivalvia	Trigoniida	Trigoniidae	Neotrigonia	Brooch Shell
Rhomboidella rhyllensis	Bivalvia	Mytilida	Mytilidae	Rhomboidella	Mussel
Saltocuna particula	Bivalvia	Lucinida	Lucinidae	Saltocuna	Cockle
Arcuatula senhousia	Bivalvia	Mytilida	Mytilidae	Arcuatula	Senhouse's Mussel
Cosa fimbriata	Bivalvia	Arcida	Philobryidae	Cosa	Bivalve
Lyrodus pedicellatus	Bivalvia	Myida	Teredinidae	Lyrodus	Shipworm
Semelangulus tenuiliratus	Bivalvia	Cardiida	Tellinidae	Semelangulus	Fine-ridged Tellen
Irus (Irus) cumingii	Bivalvia	Cardiida	Veneridae	Irus	Venus Cockle
Humphreyia strangei	Bivalvia		Penicillidae	Humphreyia	Watering Pot Shell
Myadora royana	Bivalvia		Myochamidae	Myadora	Bivalve
Solamen recens	Bivalvia	Mytilida	Mytilidae	Solamen	Boat Mussel
Lepton trigonale	Bivalvia	Cardiida	Lasaeidae	Lepton	Triangular Lepton
Epicodakia consettiana	Bivalvia	Lucinida	Lucinidae	Epicodakia	Cockle
Notocallista disrupta	Bivalvia	Cardiida	Veneridae	Notocallista	Disrupta Venus Shell
Verticordia tasmanica	Bivalvia		Verticordiidae	Verticordia	Bivalve

Circomphalus disjecta	Bivalvia	Cardiida	Veneridae	Circomphalus	Wedding-cake Cockle
Lima (Lima) vulgaris	Bivalvia	Limida	Limidae	Lima	File Shell
Tucetona gealei	Bivalvia	Arcida	Glycymerididae	Tucetona	Dog Cockle
Cucurbitula tasmanica	Bivalvia	Cardiida	Gastrochaenidae	Cucurbitula	Flask Cockle
Cadella semitorta	Bivalvia	Cardiida	Tellinidae	Cadella	Bivalve
Parvamussium thetidis	Bivalvia	Pectinida	Propeamussiidae	Parvamussium	Thetis Saucer Scallop
Lepton australis	Bivalvia	Cardiida	Lasaeidae	Lepton	Bivalve
Myochama tasmanica	Bivalvia		Myochamidae	Myochama	Bivalve
Kellia rotunda	Bivalvia	Cardiida	Kelliidae	Kellia	Bivalve
Warrana lunata	Bivalvia	Carditida	Condylocardiidae	Warrana	Bivalve
Myadora antipodum	Bivalvia		Myochamidae	Myadora	Bivalve
Perrierina (Legrandina) bernardi	Bivalvia		Cyamiidae	Perrierina	Bivalve
Donax (Deltachion) electilis	Bivalvia	Cardiida	Donacidae	Donax	Southern Wedge Shell
Hemidonax chapmani	Bivalvia	Cardiida	Hemidonacidae	Hemidonax	Surf Clam
Borniola radiata	Bivalvia	Cardiida	Lasaeidae	Borniola	Bivalve
Scaeochlamys livida	Bivalvia	Pectinida	Pectinidae	Scaeochlamys	Scallop
Neolepton antipodum	Bivalvia	Cardiida	Neoleptonidae	Neolepton	Bivalve
Mysella ovata	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Cyamiomactra balaustina	Bivalvia		Cyamiidae	Cyamiomactra	Bivalve
Thracidora arenosa	Bivalvia		Thraciidae	Thracidora	Bivalve
Propecuna obliquissima	Bivalvia	Carditida	Condylocardiidae	Propecuna	Bivalve
Hamacuna hamata	Bivalvia	Carditida	Condylocardiidae	Hamacuna	Bivalve
Laternula (Laternula) gracilis	Bivalvia		Laternulidae	Laternula	Lantern Clam
Tawera marionae	Bivalvia	Cardiida	Veneridae	Tawera	
Parvikellia ovata	Bivalvia	Cardiida	Galeommatidae	Parvikellia	
Mysella angasiana	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Myadora pandoriformis	Bivalvia		Myochamidae	Myadora	Bivalve
Cavatidens omissus	Bivalvia	Lucinida	Lucinidae	Cavatidens	
Dianadema multangularis	Bivalvia		Clavagellidae	Dianadema	Watering Pot Shell
Pseudamussium challengeri	Bivalvia	Pectinida	Pectinidae	Pseudamussium	Scallop
Spinosipella deshayesiana	Bivalvia		Verticordiidae	Spinosipella	Bivalve
Cuna navicula	Bivalvia	Carditida	Condylocardiidae	Cuna	Bivalve
Parvamussium maorium	Bivalvia	Pectinida	Propeamussiidae	Parvamussium	Deepwater Scallop
Musculium (Sphaerinova) tatiarae	Bivalvia		Sphaeriidae	Musculium	Freshwater Cockle
Ledella miliacea	Bivalvia	Nuculanida	Nuculanidae	Ledella	Minute Elongated Nut Shell
Abra profundorum	Bivalvia	Cardiida	Semelidae	Abra	Bivalve
Nucula (Nucula) mayi	Bivalvia	Nuculida	Nuculidae	Nucula	Nut Cockle
Exosiperna scapha	Bivalvia	Mytilida	Mytilidae	Exosiperna	Little Boat Mussel
Carditellopsis elegantula	Bivalvia	Carditida	Condylocardiidae	Carditellopsis	Elegant Carditella
Borniola lepida	Bivalvia	Cardiida	Lasaeidae	Borniola	Bivalve
Cardita crassicosta	Bivalvia	Carditida	Carditidae	Cardita	Cockle
Mysella dromanaensis	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Myadora ovata	Bivalvia		Myochamidae	Myadora	Bivalve
Plectodon brazieri	Bivalvia		Cuspidariidae	Plectodon	Bivalve
Cardita variegata	Bivalvia	Carditida	Carditidae	Cardita	Cockle
Limaria (Platilimaria) orientalis	Bivalvia	Limida	Limidae	Limaria	File Clam
Thracia (Eximiothracia) myodoroides	Bivalvia		Thraciidae	Thracia	Bivalve
Hiatella arctica	Bivalvia	Adapedonta	Hiatellidae	Hiatella	Bivalve
Crassostrea gigas	Bivalvia	Ostreida	Ostreidae	Crassostrea	Pacific Oyster
Lissarca picta	Bivalvia	Arcida	Philobryidae	Lissarca	Bivalve

Bankia neztalia	Bivalvia	Myida	Teredinidae	Bankia	Shipworm
Bassina (Bassina) jacksoni	Bivalvia	Cardiida	Veneridae	Bassina	Jackson's Bassina
Thraciopsis peroniana	Bivalvia		Thraciidae	Thraciopsis	Bivalve
Ennucula diaphana	Bivalvia	Nuculida	Nuculidae	Ennucula	Nut Cockle
Parvikellia meridionalis	Bivalvia	Cardiida	Galeommatidae	Parvikellia	
Lima (Fukama) benthonimbifer	Bivalvia	Limida	Limidae	Lima	File Clam
Condylocardia cometa	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Cosa tatei	Bivalvia	Arcida	Philobryidae	Cosa	Bivalve
Hyridella (Hyridella) depressa	Bivalvia	Unionida	Hyriidae	Hyridella	Freshwater Mussel
Mactra (Mactra) eximia	Bivalvia	Cardiida	Mactridae	Mactra	Pretty Trough Shell
Tellinota imbellis	Bivalvia	Cardiida	Tellinidae	Tellinota	
Zenatina victoriae	Bivalvia	Cardiida	Mactridae	Zenatina	Clam
Notomyrtea botanica	Bivalvia	Lucinida	Lucinidae	Notomyrtea	Cockle
Thracia (Eximiothracia) speciosa	Bivalvia		Thraciidae	Thracia	Beautiful Thracia
Warrana edentata	Bivalvia	Carditida	Condylocardiidae	Warrana	Bivalve
Codakia rugifera	Bivalvia	Lucinida	Lucinidae	Codakia	Cockle
Hyridella (Hyridella) australis	Bivalvia	Unionida	Hyriidae	Hyridella	Freshwater Mussel
Cosa auriculata	Bivalvia	Arcida	Philobryidae	Cosa	Bivalve
Myrtea mayi	Bivalvia	Lucinida	Lucinidae	Myrtea	May's Lucina
Limea (Gemellima) parvula	Bivalvia	Limida	Limidae	Limea	File Clam
Abra exigua	Bivalvia	Cardiida	Semelidae	Abra	Bivalve
Rhinoclama alta	Bivalvia		Cuspidariidae	Rhinoclama	Bivalve
Epicodakia perobliqua	Bivalvia	Lucinida	Lucinidae	Epicodakia	Cockle
Destacar metella	Bivalvia	Arcida	Arcidae	Destacar	Ark Shell
Austrocardiella trifoliata	Bivalvia	Carditida	Condylocardiidae	Austrocardiella	Bivalve
Mysella concentrica	Bivalvia	Cardiida	Montacutidae	Mysella	
Myllita (Myllita) auriculata	Bivalvia	Cardiida	Lasaeidae	Myllita	Bivalve
Lutraria rhynchaena	Bivalvia	Cardiida	Mactridae	Lutraria	Otter's Shell
Cuspidaria erma	Bivalvia		Cuspidariidae	Cuspidaria	Bivalve
Teredo navalis	Bivalvia	Myida	Teredinidae	Teredo	Shipworm
Amygdalum lineum	Bivalvia	Mytilida	Mytilidae	Amygdalum	Mussel
Numella adamsi	Bivalvia		Ungulinidae	Numella	Bivalve
Monia (Tenuimonia) deliciosa	Bivalvia	Pectinida	Anomiidae	Monia	Jingle Shell
Salaputium fulvidum	Bivalvia	Carditida	Crassatellidae	Salaputium	Cockle
Perna canaliculus	Bivalvia	Mytilida	Mytilidae	Perna	Green Mussel
Condylocardia crassicosta	Bivalvia	Carditida	Condylocardiidae	Condylocardia	Bivalve
Thracia (Eximiothracia) modesta	Bivalvia		Thraciidae	Thracia	Bivalve
Nuculana (Nuculana) fulgida	Bivalvia	Nuculanida	Nuculanidae	Nuculana	Beaked Cockle
Warrana dielasma	Bivalvia	Carditida	Condylocardiidae	Warrana	Bivalve
Irus (Notirus) exoticus	Bivalvia	Cardiida	Veneridae	Irus	Cockle
Abranda modestina	Bivalvia	Cardiida	Tellinidae	Abranda	Bivalve
Mactra (Mactra) pusilla	Bivalvia	Cardiida	Mactridae	Mactra	Clam
Cuspidaria angasi	Bivalvia		Cuspidariidae	Cuspidaria	Bivalve
Mysella vitrea	Bivalvia	Cardiida	Montacutidae	Mysella	Bivalve
Ennucula astricta	Bivalvia	Nuculida	Nuculidae	Ennucula	Astricta Nut Shell
Limopsis (Senectidens) eucosmus	Bivalvia	Arcida	Limopsidae	Limopsis	Dog Cockle
Limopsis (Limopsis) vixornata	Bivalvia	Arcida	Limopsidae	Limopsis	Dog Cockle
Philobrya robensis	Bivalvia	Arcida	Philobryidae	Philobrya	Bivalve
Raeta (Raeta) meridionalis	Bivalvia	Cardiida	Mactridae	Raeta	Clam
Phragmorisma watsoni	Bivalvia		Thraciidae	Phragmorisma	Bivalve

Rhinoclama tasmanica	Bivalvia		Cuspidariidae	Rhinoclama	Bivalve
Pinctada imbricata	Bivalvia	Ostreida	Pteriidae	Pinctada	Pearl Oyster
Carditellona angasi	Bivalvia	Carditida	Condylocardiidae	Carditellona	Angas' Carditella
Cuna saza	Bivalvia	Carditida	Condylocardiidae	Cuna	Bivalve
Nucula (Nucula) beachportensis	Bivalvia	Nuculida	Nuculidae	Nucula	Nut Cockle
Pinna bicolor	Bivalvia	Ostreida	Pinnidae	Pinna	Razor Fish / Razor Back
Pileatona compressa	Bivalvia	Cardiida	Galeommatidae	Pileatona	Bivalve
Ephippodonta lunata	Bivalvia	Cardiida	Galeommatidae	Ephippodonta	Moon Cockle
Vulsella vulsella	Bivalvia	Ostreida	Pteriidae	Vulsella	Pearl Oyster
Austromactra contraria	Bivalvia	Cardiida	Mactridae	Austromactra	Contrary Mactra
Mendicula memorata	Bivalvia	Lucinida	Thyasiridae	Mendicula	Bivalve
Circe (Circe) scripta	Bivalvia	Cardiida	Veneridae	Circe	Circular Tapestry Shell
Puyseguria chapmani	Bivalvia	Cardiida	Neoleptonidae	Puyseguria	Bivalve
Ennucula dilecta	Bivalvia	Nuculida	Nuculidae	Ennucula	Nut Cockle
Fluviolanatus subtortus	Bivalvia	Cardiida	Trapezidae	Fluviolanatus	Bivalve
Kellia jacksoniana	Bivalvia	Cardiida	Kelliidae	Kellia	Bivalve
Ledella inopinata	Bivalvia	Nuculanida	Nuculanidae	Ledella	Beaked Cockle
Pseudolucinisca lacteola	Bivalvia	Lucinida	Lucinidae	Pseudolucinisca	Milky Lucina
Salaputium probleemum	Bivalvia	Carditida	Crassatellidae	Salaputium	Cockle
Bankia australis	Bivalvia	Myida	Teredinidae	Bankia	Bankia Or Many-coned Shipworm
Lucinoma yoshidai	Bivalvia	Lucinida	Lucinidae	Lucinoma	Cockle
Ephippodonta macdougalli	Bivalvia	Cardiida	Galeommatidae	Ephippodonta	Moon Cockle
Kelliella tasmanensis	Bivalvia	Veneroida	Kelliellidae	Kelliella	
Acar botanica	Bivalvia	Arcida	Arcidae	Acar	Ark Shell
Pronucula decorosa	Bivalvia	Nuculida	Nuculidae	Pronucula	Nut Cockle
Venericardia columnaria	Bivalvia	Carditida	Carditidae	Venericardia	Cockle
Corbula (Solidicorbula) hydropica	Bivalvia	Myida	Corbulidae	Corbula	Cockle
Serratina capsoides	Bivalvia	Cardiida	Tellinidae	Serratina	
Pisidium (Euglesa) carum	Bivalvia		Sphaeriidae	Pisidium	Freshwater Cockle
Channelaxinus benthicola	Bivalvia	Lucinida	Thyasiridae	Channelaxinus	
Nemocardium probatum	Bivalvia	Cardiida	Cardiidae	Nemocardium	Bechi Cockle
Neotrigonia bednalli	Bivalvia	Trigoniida	Trigoniidae	Neotrigonia	Brooch Shell
Cyclopecten kapalae	Bivalvia	Pectinida	Propeamussiidae	Cyclopecten	Deepwater Scallop
Neotrigonia uniophora	Bivalvia	Trigoniida	Trigoniidae	Neotrigonia	Brooch Shell
Thraciopsis angustata	Bivalvia		Thraciidae	Thraciopsis	Bivalve
Fluctiger royanus	Bivalvia	Carditida	Crassatellidae	Fluctiger	Cockle
Adacnarca squamea	Bivalvia	Arcida	Philobryidae	Adacnarca	Bivalve
Thracia (Eximiothracia) stutchburyi	Bivalvia		Thraciidae	Thracia	Bivalve
Cosa pharetra	Bivalvia	Arcida	Philobryidae	Cosa	Bivalve
Cyclocardia calva	Bivalvia	Carditida	Carditidae	Cyclocardia	
Nototeredo edax	Bivalvia	Myida	Teredinidae	Nototeredo	Shipworm
Hyridella (Protohyridella) glenelgensis	Bivalvia	Unionida	Hyriidae	Hyridella	Glenelg Freshwater Mussel
Tridacna (Chametrachea) crocea	Bivalvia	Cardiida	Cardiidae	Tridacna	Giant Clam
Cardiomya pinna	Bivalvia		Cuspidariidae	Cardiomya	Bivalve
Pronucula covra	Bivalvia	Nuculida	Nuculidae	Pronucula	
Chama ruderalis	Bivalvia	Cardiida	Chamidae	Chama	Chama
Corbula (Serracorbula) verconis	Bivalvia	Myida	Corbulidae	Corbula	
Barbatia (Abarbatia) parvivillosa	Bivalvia	Arcida	Arcidae	Barbatia	Ark Shell
Parathyasira resupina	Bivalvia	Lucinida	Thyasiridae	Parathyasira	Bivalve
Cuspidaria latesulcata	Bivalvia		Cuspidariidae	Cuspidaria	Bivalve

Warrana cessens	Bivalvia	Carditida	Condylocardiidae	Warrana	Bivalve
Acesta (Acesta) saginata	Bivalvia	Limida	Limidae	Acesta	File Clam
Saccella caloundra	Bivalvia	Nuculanida	Nuculanidae	Saccella	Beaked Cockle
Proxichione materna	Bivalvia	Cardiida	Veneridae	Proxichione	
Cyclochlamys nepeanensis	Bivalvia	Pectinida	Cyclochlamydidae	Cyclochlamys	Deepwater Scallop
Timoclea scabra	Bivalvia	Cardiida	Veneridae	Timoclea	Rough Venus
Pandora (Frenamya) aversus	Bivalvia		Pandoridae	Pandora	Bivalve
Pinguitellina robusta	Bivalvia	Cardiida	Tellinidae	Pinguitellina	Robust Tellen
Pisidium (Afropisidium) aslini	Bivalvia		Sphaeriidae	Pisidium	Freshwater Cockle
Hunkydora australica	Bivalvia		Myochamidae	Hunkydora	Bivalve
Propeamussium meridionale	Bivalvia	Pectinida	Propeamussiidae	Propeamussium	Deepwater Scallop
Tridacna (Chametrachea) maxima	Bivalvia	Cardiida	Cardiidae	Tridacna	Giant Clam
Samacar strabo	Bivalvia	Arcida	Arcidae	Samacar	Ark Shell
Carditella subtrigona	Bivalvia	Carditida	Condylocardiidae	Carditella	Bivalve
Channelaxinus adelaideanus	Bivalvia	Lucinida	Thyasiridae	Channelaxinus	
Modiolus peronianus	Bivalvia	Mytilida	Mytilidae	Modiolus	Mussel
Limatula powelli	Bivalvia	Limida	Limidae	Limatula	File Clam
Lamellileda typica	Bivalvia	Nuculanida	Nuculanidae	Lamellileda	Beaked Cockle
Micropolia typica	Bivalvia	Cardiida	Neoleptonidae	Micropolia	Bivalve
Lasaea purpurata	Bivalvia	Cardiida	Lasaeidae	Lasaea	
Ciboticola lunata	Bivalvia	Mytilida	Mytilidae	Ciboticola	Shell-clinging Mussel
Talabrica carnea	Bivalvia	Carditida	Crassatellidae	Talabrica	Cockle
Barbatia (Cucullaearca) foliata	Bivalvia	Arcida	Arcidae	Barbatia	Ark Shell
Vermitexta garrardi	Bivalvia	Cardiida	Galeommatidae	Vermitexta	Bivalve
Dosinia (Fallartemis) sculpta	Bivalvia	Cardiida	Veneridae	Dosinia	Sculptured Dosinia
Jolya arata	Bivalvia	Mytilida	Mytilidae	Jolya	The Furrowed Modiola
Pulvinites exempla	Bivalvia	Ostreida	Pulvinitidae	Pulvinites	Bivalve
Tucetona broadfooti	Bivalvia	Arcida	Glycymerididae	Tucetona	Dog Cokle
Ennucula flindersi	Bivalvia	Nuculida	Nuculidae	Ennucula	
Cunanax pisum	Bivalvia	Carditida	Condylocardiidae	Cunanax	Bivalve
Arcuatula glaberrima	Bivalvia	Mytilida	Mytilidae	Arcuatula	Mussel
Rhinoclama simulans	Bivalvia		Cuspidariidae	Rhinoclama	Bivalve
Cunanax crassidentata	Bivalvia	Carditida	Condylocardiidae	Cunanax	Bivalve
Nuculana (Nuculana) ramsayi	Bivalvia	Nuculanida	Nuculanidae	Nuculana	Beaked Cockle
Felaniella (Zemysia) sublateralis	Bivalvia		Ungulinidae	Felaniella	Bivalve
Solamen spectabilis	Bivalvia	Mytilida	Mytilidae	Solamen	Mussel
Neotrigonia strangei	Bivalvia	Trigoniida	Trigoniidae	Neotrigonia	Strange's Trigonia
Benthocardiella burtonae	Bivalvia	Carditida	Condylocardiidae	Benthocardiella	Bivalve
Gafrarium (Gafrarium) pectinatum	Bivalvia	Cardiida	Veneridae	Gafrarium	Comb Circe
Donax (Deltachion) brazieri	Bivalvia	Cardiida	Donacidae	Donax	Brazier's Wedge Shell
Nototodarus gouldi	Cephalopoda	Teuthida	Ommastrephidae	Nototodarus	Red Arrow Squid
Sepioteuthis australis	Cephalopoda	Teuthida	Loliginidae	Sepioteuthis	Southern Calamari
Euprymna tasmanica	Cephalopoda	Sepiolida	Sepiolidae	Euprymna	Southern Bobtail Squid
Sepia apama	Cephalopoda	Sepiida	Sepiidae	Sepia	Giant Cuttlefish
Hapalochlaena maculosa	Cephalopoda	Octopoda	Octopodidae	Hapalochlaena	Southern Blue-ringed Octopus
Xipholeptos notoides	Cephalopoda	Sepiolida	Idiosepiidae	Xipholeptos	Southern Pygmy Squid
Octopus pallidus	Cephalopoda	Octopoda	Octopodidae	Octopus	Pale Octopus
Sepia hedleyi	Cephalopoda	Sepiida	Sepiidae	Sepia	King Cuttlefish
Sepia novaehollandiae	Cephalopoda	Sepiida	Sepiidae	Sepia	Cuttlefish
Sepia braggi	Cephalopoda	Sepiida	Sepiidae	Sepia	Bragg's Cuttlefish

Octopus berrima	Cephalopoda	Octopoda	Octopodidae	Octopus	Octopus
Argonauta nodosus	Cephalopoda	Octopoda	Argonautidae	Argonauta	Argonaut
Macroctopus maorum	Cephalopoda	Octopoda	Octopodidae	Pinnoctopus	Maori Octopus
Octopus kaurna	Cephalopoda	Octopoda	Octopodidae	Octopus	Southern Sand Octopus
Sepia cultrata	Cephalopoda	Sepiida	Sepiidae	Sepia	Knifebone Cuttlefish
Sepiadarium austrinum	Cephalopoda	Sepiida	Sepiadariidae	Sepiadarium	Southern Bottletail Squid
Spirula spirula	Cephalopoda	Sepiida	Spirulidae	Spirula	Rams-horn Squid
Octopus maorum	Cephalopoda	Octopoda	Octopodidae	Octopus	Maori Octopus
Austrorossia australis	Cephalopoda	Sepiolida	Sepiolidae	Austrorossia	Dumpling Squid
Abraliopsis gilchristi	Cephalopoda	Teuthida	Enoploteuthidae	Abraliopsis	Armed Squid
Callistoctopus bunurong	Cephalopoda	Octopoda	Octopodidae	Callistoctopus	Southern White-spot Octopus
Architeuthis dux	Cephalopoda	Teuthida	Architeuthidae	Architeuthis	Giant Squid
Opisthoteuthis persephone	Cephalopoda	Octopoda	Opisthoteuthidae	Opisthoteuthis	Jelly Octopod
Histioteuthis atlantica	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Squid
Lycoteuthis lorigera	Cephalopoda	Teuthida	Lycoteuthidae	Lycoteuthis	Squid
Enoploteuthis galaxias	Cephalopoda	Teuthida	Enoploteuthidae	Enoploteuthis	Squid
Neorossia leptodons	Cephalopoda	Sepiolida	Sepiolidae	Neorossia	Dumpling Squid
Teuthowenia pellucida	Cephalopoda	Teuthida	Cranchiidae	Teuthowenia	Squid
Octopus superciliosus	Cephalopoda	Octopoda	Octopodidae	Octopus	Frilled Pygmy Octopus
Octopus warringa	Cephalopoda	Octopoda	Octopodidae	Octopus	Club Pygmy Octopus
Pinnoctopus cordiformis	Cephalopoda	Octopoda	Octopodidae	Pinnoctopus	
Octopus australis	Cephalopoda	Octopoda	Octopodidae	Octopus	Southern Octopus
Pyroteuthis margaritifera	Cephalopoda	Teuthida	Pyroteuthidae	Pyroteuthis	Squid
Uroteuthis (Aestuariolus) noctiluca	Cephalopoda	Teuthida	Loliginidae	Uroteuthis	Luminous Bay Squid
Heteroteuthis (Stephanoteuthis) serventyi	Cephalopoda	Sepiolida	Sepiolidae	Heteroteuthis	Dumpling Squid
Todarodes filippovae	Cephalopoda	Teuthida	Ommastrephidae	Todarodes	Southern Ocean Arrow Squid
Ocythoe tuberculata	Cephalopoda	Octopoda	Ocythoidae	Ocythoe	Argonautoid Octopod
Histioteuthis miranda	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Squid
Brachioteuthis riisei	Cephalopoda	Teuthida	Brachioteuthidae	Brachioteuthis	Squid
Octopus tetricus	Cephalopoda	Octopoda	Octopodidae	Octopus	Gloomy Octopus
Histioteuthis macrohista	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Jewel Squid
Chiroteuthis veranyi	Cephalopoda	Teuthida	Chiroteuthidae	Chiroteuthis	Squid
Onykia robsoni	Cephalopoda	Teuthida	Onychoteuthidae	Onykia	Squid
Sepiolina nipponensis	Cephalopoda	Sepiolida	Sepiolidae	Sepiolina	Dumpling Squid
Pholidoteuthis massyae	Cephalopoda	Teuthida	Pholidoteuthidae	Pholidoteuthis	Squid
Moroteuthis ingens	Cephalopoda	Teuthida	Onychoteuthididae	Moroteuthis	
Mesonychoteuthis hamiltoni	Cephalopoda	Teuthida	Cranchiidae	Mesonychoteuthis	Antarctic Cranch Squid
Ancistrocheirus lesueuri	Cephalopoda	Teuthida	Ancistrocheiridae	Ancistrocheirus	Sharpear Enope Squid
Cranchia scabra	Cephalopoda	Teuthida	Cranchiidae	Cranchia	Squid
Amphitretus pelagicus	Cephalopoda	Octopoda	Amphitretidae	Amphitretus	Telescope Octopus
Helicocranchia pfefferi	Cephalopoda	Teuthida	Cranchiidae	Helicocranchia	Squid
Opisthoteuthis pluto	Cephalopoda	Octopoda	Opisthoteuthidae	Opisthoteuthis	Jelly Octopod
Lepidoteuthis grimaldii	Cephalopoda	Teuthida	Lepidoteuthidae	Lepidoteuthis	Scaled Squid
Mastigoteuthis agassizii	Cephalopoda	Teuthida	Mastigoteuthidae	Mastigoteuthis	
Ommastrephes bartramii	Cephalopoda	Teuthida	Ommastrephidae	Ommastrephes	Red Ocean Squid
Pholidoteuthis boschmai	Cephalopoda	Teuthida	Pholidoteuthidae	Pholidoteuthis	
Bathothauma lyromma	Cephalopoda	Teuthida	Cranchiidae	Bathothauma	Squid
Mastigoteuthis cordiformis	Cephalopoda	Teuthida	Mastigoteuthidae	Mastigoteuthis	
Sepia grahami	Cephalopoda	Sepiida	Sepiidae	Sepia	Ken's Cuttlefish
Todaropsis eblanae	Cephalopoda	Teuthida	Ommastrephidae	Todaropsis	Lesser Flying Squid

Histioteuthis bonnellii	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Squid
Grimpella thaumastocheir	Cephalopoda	Octopoda	Octopodidae	Grimpella	Velvet Octopus
Vampyroteuthis infernalis	Cephalopoda	Vampyromorpha	Vampyroteuthidae	Vampyroteuthis	Vampire Squid
Pterygioteuthis gemmata	Cephalopoda	Teuthida	Pyroteuthidae	Pterygioteuthis	Squid
Sepioloidea lineolata	Cephalopoda	Sepiida	Sepiadariidae	Sepioloidea	Striped Pyjama Squid
Argonauta argo	Cephalopoda	Octopoda	Argonautidae	Argonauta	Argonaut
Histioteuthis eltaninae	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Squid
Octopoteuthis rugosa	Cephalopoda	Teuthida	Octopoteuthidae	Octopoteuthis	Squid
Nautilus macromphalus	Cephalopoda	Nautilida	Nautilidae	Nautilus	Chambered Nautilus
Onykia loennbergii	Cephalopoda	Teuthida	Onychoteuthidae	Onykia	Hooked Squid
Discoteuthis laciniosa	Cephalopoda	Teuthida	Cycloteuthidae	Discoteuthis	Squid
Abraliopsis tui	Cephalopoda	Teuthida	Enoploteuthidae	Abraliopsis	Armed Squid
Onychoteuthis aequimanus	Cephalopoda	Teuthida	Onychoteuthidae	Onychoteuthis	Squid
Cirroteuthis muelleri	Cephalopoda	Octopoda	Cirroteuthididae	Cirroteuthis	
Chtenopteryx sicula	Cephalopoda	Teuthida	Chtenopterygidae	Chtenopteryx	Comb-finned Squid
Moroteuthis robsoni	Cephalopoda	Teuthida	Onychoteuthididae	Moroteuthis	
Histioteuthis meleagroteuthis	Cephalopoda	Teuthida	Histioteuthidae	Histioteuthis	Squid
Gonatus antarcticus	Cephalopoda	Teuthida	Gonatidae	Gonatus	Squid
Eucleoteuthis luminosa	Cephalopoda	Teuthida	Ommastrephidae	Eucleoteuthis	Squid
Megalocranchia abyssicola	Cephalopoda	Teuthida	Cranchiidae	Megalocranchia	Squid
Pterygioteuthis giardi	Cephalopoda	Teuthida	Pyroteuthidae	Pterygioteuthis	Squid
Sandalops melancholicus	Cephalopoda	Teuthida	Cranchiidae	Sandalops	Squid
Mastigoteuthis hjorti	Cephalopoda	Teuthida	Mastigoteuthidae	Mastigoteuthis	
Onychoteuthis banksii	Cephalopoda	Teuthida	Onychoteuthidae	Onychoteuthis	
Sepia plangon	Cephalopoda	Sepiida	Sepiidae	Sepia	Cuttlefish
Sepia papuensis	Cephalopoda	Sepiida	Sepiidae	Sepia	Papuan Cuttlefish
Sepia mestus	Cephalopoda	Sepiida	Sepiidae	Sepia	Reaper Cuttlefish
Taningia danae	Cephalopoda	Teuthida	Octopoteuthidae	Taningia	Squid
Onychoteuthis meridiopacifica	Cephalopoda	Teuthida	Onychoteuthidae	Onychoteuthis	Squid
Sepia chirotrema	Cephalopoda	Sepiida	Sepiidae	Sepia	Cuttlefish
Ornithoteuthis volatilis	Cephalopoda	Teuthida	Ommastrephidae	Ornithoteuthis	Long-tailed Flying Squid
Haliotis rubra	Gastropoda		Haliotidae	Haliotis	Warty Ear Shell
Lunella (Subninella) undulatus	Gastropoda		Turbinidae	Lunella	Wavy Periwinkle
Dicathais orbita	Gastropoda	Hypsogastropoda	Muricidae	Dicathais	Whelk
Cellana tramoserica	Gastropoda		Nacellidae	Cellana	Limpet
Haliotis laevigata	Gastropoda		Haliotidae	Haliotis	Green-lip Abalone
Cominella (Cominella) lineolata	Gastropoda	Hypsogastropoda	Buccinidae	Cominella	Lineated Cominella
Bembicium nanum	Gastropoda	Hypsogastropoda	Littorinidae	Bembicium	Striped-mouth Conniwink
Austrocochlea constricta	Gastropoda		Trochidae	Austrocochlea	Ribbed Periwinkle
Siphonaria diemenensis	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Australaria australasia	Gastropoda	Hypsogastropoda	Fasciolariidae	Australaria	Tulip Shell
Conus (Floraconus) anemone	Gastropoda	Hypsogastropoda	Conidae	Conus	The Anemone Cone
Scutus (Scutus) antipodes	Gastropoda		Fissurellidae	Scutus	Boat Shell
Patelloida alticostata	Gastropoda		Lottiidae	Patelloida	Tall-ribbed Limpet
Austrolittorina unifasciata	Gastropoda	Hypsogastropoda	Littorinidae	Austrolittorina	Periwinkle
Bedeva vinosa	Gastropoda	Hypsogastropoda	Muricidae	Bedeva	Wine-mouthed Lepsiella
Ceratosoma brevicaudatum	Gastropoda	Nudibranchia	Chromodorididae	Ceratosoma	Nudibranch
Montfortula rugosa	Gastropoda		Fissurellidae	Montfortula	Rough Notch Limpet
Nerita (Lisanerita) atramentosa	Gastropoda	Neritopsina	Neritidae	Nerita	Black Crow
Cabestana spengleri	Gastropoda	Hypsogastropoda	Cymatiidae	Cabestana	Spengler's Triton

Theba pisana	Gastropoda	Stylommatophora	Helicidae	Theba	White Italian Snail
Scutellastra peronii	Gastropoda		Patellidae	Scutellastra	Limpet
Phasianella ventricosa	Gastropoda		Turbinidae	Phasianella	Pheasant Shell
Doriopsilla carneola	Gastropoda	Nudibranchia	Dendrodorididae	Doriopsilla	Nudibranch
Phasianella australis	Gastropoda		Turbinidae	Phasianella	Australian Pheasant Or Painted Lady
Notoacmea flammea	Gastropoda		Lottiidae	Notoacmea	Limpet
Diloma concamerata	Gastropoda		Trochidae	Diloma	Austrocochlea Grouped-in-hiding
Chlorodiloma odontis	Gastropoda		Trochidae	Chlorodiloma	The Edentulate Austrocochlea
Notocypraea comptoni	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Cowrie
Nassarius (Niotha) nigellus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Tasmanian Dog Whelk
Clanculus plebejus	Gastropoda		Trochidae	Clanculus	Plebian Top Shell
Calyptraea calyptraeformis	Gastropoda	Hypsogastropoda	Calyptraeidae	Calyptraea	Shelf Limpet
Phasianotrochus eximius	Gastropoda		Trochidae	Phasianotrochus	Kelp Shell
Afrolittorina praetermissa	Gastropoda	Hypsogastropoda	Littorinidae	Afrolittorina	Checked Australwink
Prothalotia pulcherrimus	Gastropoda		Trochidae	Prothalotia	Beautiful Cantharidus
Tambja cf. verconis	Gastropoda	Nudibranchia	Polyceridae	Tambja	
Chlorodiloma adelaidae	Gastropoda		Trochidae	Chlorodiloma	Adelaide Periwinkle
Notocypraea angustata	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Cowrie
Dentimitrella semiconvexa	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Semiconvexa Dove Shell
Nassarius (Zeuxis) pyrrhus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Dog Whelk
Magilaoma penolensis	Gastropoda	Stylommatophora	Punctidae	Magilaoma	Penola Pinhead Snail
Patelloida latistrigata	Gastropoda		Lottiidae	Patelloida	Limpet
Hipponix australis	Gastropoda	Hypsogastropoda	Hipponicidae	Hipponix	Horse Hoof Limpet
Cacozeliana granarium	Gastropoda	Cerithimorpha	Cerithiidae	Cacozeliana	Creeper
Cymatiella verrucosa	Gastropoda	Hypsogastropoda	Cymatiidae	Cymatiella	Triton Shell
Phyllodesmium serratum	Gastropoda	Nudibranchia	Facelinidae	Phyllodesmium	Nudibranch
Polycera hedgpethi	Gastropoda	Nudibranchia	Polyceridae	Polycera	Nudibranch
Penion mandarinus	Gastropoda	Hypsogastropoda	Buccinidae	Penion	Whelk
Dentimitrella tenuis	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Long Dove Shell
Austraeolis ornata	Gastropoda	Nudibranchia	Facelinidae	Austraeolis	Nudibranch
Doris cameroni	Gastropoda	Nudibranchia	Dorididae	Doris	Nudibranch
Astralium aureum	Gastropoda		Turbinidae	Astralium	Golden Small Star
Austropyrgus turbatus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Austrocochlea porcata	Gastropoda		Trochidae	Austrocochlea	Top Shell
Goniobranchus epicurius	Gastropoda	Nudibranchia	Chromodorididae	Goniobranchus	Nudibranch
Verconia haliclona	Gastropoda	Nudibranchia	Chromodorididae	Verconia	Nudibranch
Haliotis scalaris	Gastropoda		Haliotidae	Haliotis	Staircase Abalone
Herpetopoma aspersus	Gastropoda		Chilodontidae	Herpetopoma	Gastropod
Ellatrivia merces	Gastropoda	Hypsogastropoda	Triviidae	Ellatrivia	Bean Cowrie
Philine angasi	Gastropoda	Cephalaspidea	Philinidae	Philine	Gastropod
Amblychilepas nigrita	Gastropoda		Fissurellidae	Amblychilepas	Black Keyhole Limpet
Opalia australis	Gastropoda	Hypsogastropoda	Epitoniidae	Opalia	Wentletrap
Siphonaria funiculata	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Notoacmea mayi	Gastropoda		Lottiidae	Notoacmea	Limpet
Conuber conicus	Gastropoda	Hypsogastropoda	Naticidae	Conuber	Conical Moon Snail
Cabestana tabulata	Gastropoda	Hypsogastropoda	Cymatiidae	Cabestana	Triton Shell
Cellana solida	Gastropoda		Nacellidae	Cellana	Limpet
Zeacumantus diemenensis	Gastropoda	Cerithimorpha	Batillariidae	Zeacumantus	Mud Creeper
Sassia kampyla	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	
Onchidella nigricans	Gastropoda	Systellommatophora	Onchidiidae	Onchidella	Air-breathing Sea Slug

Cornu aspersum	Gastropoda	Stylommatophora	Helicidae	Cornu	
Cominella (Cominella) eburnea	Gastropoda	Hypsogastropoda	Buccinidae	Cominella	Ribbed Cominella
Chromodoris alternata	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	Nudibranch
Granata imbricata	Gastropoda		Chilodontidae	Granata	Wide-mouthed Trochus
Phycothais reticulata	Gastropoda	Hypsogastropoda	Muricidae	Phycothais	Whelk
Bellastraea aurea	Gastropoda		Turbinidae	Astralium	Star Shell
Amoria undulata	Gastropoda	Hypsogastropoda	Volutidae	Amoria	Undulate Volute
Cymatiella eburnea	Gastropoda	Hypsogastropoda	Cymatiidae	Cymatiella	Triton Shell
Cystiscus angasi	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Angas's Margin Shell
Lottia mixta	Gastropoda		Lottiidae	Lottia	Limpet
Montereina paroa	Gastropoda	Nudibranchia	Discodorididae	Montereina	Nudibranch
Gazameda gunnii	Gastropoda	Cerithimorpha	Turritellidae	Gazameda	Gunn's Screw Shell
Liloa brevis	Gastropoda	Cephalaspidea	Haminoeidae	Liloa	Bubble Shell
Notoacmea petterdi	Gastropoda		Lottiidae	Notoacmea	Petterd's Limpet
Eunaticina umbilicata	Gastropoda	Hypsogastropoda	Naticidae	Eunaticina	Sand Snail
Siphonaria tasmanica	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Eatoniella (Eatoniella) melanochroma	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Bedeva paivae	Gastropoda	Hypsogastropoda	Muricidae	Bedeva	Oyster Drill
Pleurobranchaea maculata	Gastropoda	Pleurobranchida	Pleurobranchidae	Pleurobranchaea	Side-gill Slug
Lamellaria ophione	Gastropoda	Hypsogastropoda	Velutinidae	Lamellaria	Gastropod
Mesoginella pygmaeoides	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Anachis atkinsoni	Gastropoda	Hypsogastropoda	Columbellidae	Anachis	Dove Shell
Semicassis (Semicassis) pyrum	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Pear Bonnet
Potamopyrgus antipodarum	Gastropoda	Hypsogastropoda	Tateidae	Potamopyrgus	Hydrobiid Snail
Agnewia tritoniformis	Gastropoda	Hypsogastropoda	Muricidae	Agnewia	Common Small Purple
Clanculus limbatus	Gastropoda		Trochidae	Clanculus	Keeled Clanculus
Prothalotia lehmanni	Gastropoda		Trochidae	Prothalotia	Top Shell
Salinator fragilis	Gastropoda		Amphibolidae	Salinator	Air-breathing Snail
Tricolia rosea	Gastropoda		Turbinidae	Tricolia	Rosy Pheasant
Pterochelus triformis	Gastropoda	Hypsogastropoda	Muricidae	Pterochelus	Murex Shell
Lironoba australis	Gastropoda	Hypsogastropoda	Rissoidae	Lironoba	Rissoid
Diala suturalis	Gastropoda	Cerithimorpha	Dialidae	Diala	Gastropod
Madrella cf. ferruginosa	Gastropoda	Nudibranchia	Madrellidae	Madrella	
Bembicium melanostomum	Gastropoda	Hypsogastropoda	Littorinidae	Bembicium	Common Conniwink
Notocypraea piperita	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Peppered Cowry
Patelloida victoriana	Gastropoda		Lottiidae	Patelloida	Limpet
Patelloida insignis	Gastropoda		Lottiidae	Patelloida	Limpet
Emarginula (Emarginula) candida	Gastropoda		Fissurellidae	Emarginula	Slit Limpet
Laomavix collisi	Gastropoda	Stylommatophora	Punctidae	Laomavix	Collis' Pinhead Snail
Dentimitrella menkeana	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Menke's Dove Shell
Trinchesia catachroma	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	Nudibranch
Dentimitrella leucostoma	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	
Austromitra analogica	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Amalda marginata	Gastropoda	Hypsogastropoda	Olividae	Amalda	Marginate Ancilla
Litozamia brazieri	Gastropoda	Hypsogastropoda	Muricidae	Litozamia	Murex Shell
Paralaoma caputspinulae	Gastropoda	Stylommatophora	Punctidae	Paralaoma	Prickle Pinhead Snail
Carminodoris nodulosa	Gastropoda	Nudibranchia	Discodorididae	Carminodoris	Dorid Nudibranch
Victaphanta compacta	Gastropoda	Stylommatophora	Rhytididae	Victaphanta	Otway Black Snail
Rissoina (Rissoina) fasciata	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Polycera janjukia	Gastropoda	Nudibranchia	Polyceridae	Polycera	Nudibranch

Pleurobranchus hilli	Gastropoda	Pleurobranchida	Pleurobranchidae	Pleurobranchus	Hill's Side-gill Slug
Kaloplocamus ramosus	Gastropoda	Nudibranchia	Polyceridae	Kaloplocamus	Nudibranch
Guraleus pictus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Aplysia parvula	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Calliostoma (Fautor) armillatum	Gastropoda		Calliostomatidae	Calliostoma	Meyer's Top Shell
Clanculus undatus	Gastropoda		Trochidae	Clanculus	Top Shell
Volutomitra obscura	Gastropoda	Hypsogastropoda	Volutomitridae	Volutomitra	Volutomitrid
Tasmeuthria clarkei	Gastropoda	Hypsogastropoda	Buccinidae	Tasmeuthria	Whelk
Ascorhis tasmanica	Gastropoda	Hypsogastropoda	Tateidae	Ascorhis	Hydrobiid Snail
Chloritobadistes victoriae	Gastropoda	Stylommatophora	Camaenidae	Chloritobadistes	Southern Hairy Red Snail
Helicarion cuvieri	Gastropoda	Stylommatophora	Helicarionidae	Helicarion	
Isara carbonaria	Gastropoda	Hypsogastropoda	Mitridae	Isara	Mitre Shell
Turriplicifer australis	Gastropoda	Hypsogastropoda	Costellariidae	Turriplicifer	Costellate Mitre Shell
Dentimitrella austrina	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	
Cosmetalepas concatenatus	Gastropoda		Fissurellidae	Cosmetalepas	Pitted Keyhole Limpet
Thylacodes sipho	Gastropoda	Hypsogastropoda	Vermetidae	Thylacodes	Worm Shell
Nassarius (Niotha) pauperatus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Dog Whelk
Bankivia fasciata	Gastropoda		Trochidae	Bankivia	Top Shell
Astralium squamiferum	Gastropoda		Turbinidae	Astralium	Star Shell
Etrema (Etrema) denseplicata	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Nerita (Lisanerita) melanotragus	Gastropoda	Neritopsina	Neritidae	Nerita	Nerite
Cantharidella tiberiana	Gastropoda		Trochidae	Cantharidella	Top Shell
Pisinna approxima	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Thecacera pennigera	Gastropoda	Nudibranchia	Polyceridae	Thecacera	Nudibranch
Doto ostenta	Gastropoda	Nudibranchia	Dotidae	Doto	Nudibranch
Alaba monile	Gastropoda	Cerithimorpha	Litiopidae	Alaba	Gastropod
Dentimitrella lincolnensis	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Port Lincoln Dove Shell
Conuber sordidus	Gastropoda	Hypsogastropoda	Naticidae	Conuber	Sand Snail
Coryphellina poenicia	Gastropoda	Nudibranchia	Flabellinidae	Coryphellina	Nudibranch
Tritia burchardi	Gastropoda	Hypsogastropoda	Nassariidae	Tritia	Dog Whelk
Fusinus (Fusinus) novaehollandiae	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	New Holland Spindle
Antisabia foliacea	Gastropoda	Hypsogastropoda	Hipponicidae	Antisabia	Horse Hoof Limpet
Macroschisma tasmaniae	Gastropoda		Fissurellidae	Macroschisma	Posterior Keyhole Limpet
Plesiotrochus monachus	Gastropoda	Cerithimorpha	Plesiotrochidae	Plesiotrochus	Monk Shell
Clanculus flagellatus	Gastropoda		Trochidae	Clanculus	Top Shell
Amphithalamus (Amphithalamus) incidata	Gastropoda	Hypsogastropoda	Anabathridae	Amphithalamus	
Bembicium auratum	Gastropoda	Hypsogastropoda	Littorinidae	Bembicium	Gold-mouthed Top Shell
Epitonium (Hyaloscala) jukesiana	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Reticunassa paupera	Gastropoda	Hypsogastropoda	Nassariidae	Reticunassa	Dog Whelk
Sassia subdistorta	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Subdistorted Triton
Umbilia hesitata	Gastropoda	Hypsogastropoda	Cypraeidae	Umbilia	Wonder Cowry
Tatea rufilabris	Gastropoda	Hypsogastropoda	Tateidae	Tatea	Hydrobiid Snail
Austrodrillia beraudiana	Gastropoda	Hypsogastropoda	Horaiclavidae	Austrodrillia	Turrid Shell
Maoricrypta immersa	Gastropoda	Hypsogastropoda	Calyptraeidae	Maoricrypta	Slipper Limpet
Austroginella johnstoni	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Marginella
Dendrodoris arborescens	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	Nudibranch
Maoricolpus roseus	Gastropoda	Cerithimorpha	Turritellidae	Maoricolpus	New Zealand Screw Shell
Astele subcarinatum	Gastropoda		Calliostomatidae	Astele	Subcarinate Astele
Rissoina (Rissoina) vincentiana	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Berthella medietas	Gastropoda	Pleurobranchida	Pleurobranchidae	Berthella	Side Gill Slug

Ovaginella ovulum	Gastropoda	Hypsogastropoda	Marginellidae	Ovaginella	Marginella
Asteracmea stowae	Gastropoda		Lottiidae	Asteracmea	Limpet
Rostanga crawfordi	Gastropoda	Nudibranchia	Discodorididae	Rostanga	Nudibranch
Pyreneola fulgida	Gastropoda	Hypsogastropoda	Columbellidae	Pyreneola	Dove Shell
Paradoris dubia	Gastropoda	Nudibranchia	Discodorididae	Paradoris	Dorid Nudibranch
Bedeva baileyana	Gastropoda	Hypsogastropoda	Muricidae	Bedeva	Whelk
Notoacmea alta	Gastropoda		Lottiidae	Notoacmea	Limpet
Philinopsis taronga	Gastropoda	Cephalaspidea	Aglajidae	Philinopsis	Sea Slug
Eoacmaea calamus	Gastropoda		Eoacmaeidae	Eoacmaea	Limpet
Sydaphera granosa	Gastropoda	Hypsogastropoda	Cancellariidae	Sydaphera	Granose Cross-barred Shell
Trapania brunnea	Gastropoda	Nudibranchia	Goniodorididae	Trapania	Nudibranch
Alvania (Alvania) strangei	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Stomatella impertusa	Gastropoda		Trochidae	Stomatella	False Ear Shell
Tenagodus australis	Gastropoda	Cerithimorpha	Siliquariidae	Tenagodus	Australian Worm Shell
Scutellastra chapmani	Gastropoda		Patellidae	Scutellastra	Eight-rayed Limpet
Laevilitorina (Laevilitorina) mariae	Gastropoda	Hypsogastropoda	Littorinidae	Laevilitorina	Periwinkle
Ceratosoma amoenum	Gastropoda	Nudibranchia	Chromodorididae	Ceratosoma	Nudibranch
Amblychilepas javanicensis	Gastropoda		Fissurellidae	Amblychilepas	Keyhole Limpet
Incisura remota	Gastropoda		Scissurellidae	Incisura	Slit Shell
Phasianotrochus irisodontes	Gastropoda		Trochidae	Phasianotrochus	Top Shell
Argalista rosea	Gastropoda		Turbinidae	Argalista	Top Shell
Austropyrgus latus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Pisinna kershawi	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Thalotia conica	Gastropoda		Trochidae	Thalotia	Top Shell
Ericusa sowerbyi	Gastropoda	Hypsogastropoda	Volutidae	Ericusa	Sowerby's Volute
Antephalium semigranosum	Gastropoda	Hypsogastropoda	Cassidae	Antephalium	Half-grained Helmet
Marinula xanthostoma	Gastropoda	Ellobiida	Ellobiidae	Marinula	Air-breathing Snail
Polybranchia pallens	Gastropoda		Hermaeidae	Polybranchia	Sea Slug
Pseudamycla dermestoidea	Gastropoda	Hypsogastropoda	Columbellidae	Pseudamycla	Dove Shell
Penion maximus	Gastropoda	Hypsogastropoda	Buccinidae	Penion	Whelk
Mesoginella turbinata	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Turbinate Margin Shell
Aplysia sydneyensis	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Astralium tentoriformis	Gastropoda		Turbinidae	Astralium	Common Tent Shell
Prototyphis angasi	Gastropoda	Hypsogastropoda	Muricidae	Prototyphis	Angas' Murex
Doriopsilla aurea	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	Nudibranch
Phallomedusa solida	Gastropoda		Amphibolidae	Phallomedusa	Air-breathing Snail
Succinea (Succinea) australis	Gastropoda	Stylommatophora	Succineidae	Succinea	
Ranella australasia	Gastropoda	Hypsogastropoda	Ranellidae	Ranella	Australian Triton
Isara badia	Gastropoda	Hypsogastropoda	Mitridae	Isara	Mitre Shell
Amblychilepas oblonga	Gastropoda		Fissurellidae	Amblychilepas	Oblong Keyhole Limpet
Alvania (Alvania) fasciata	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Zalipais laseroni	Gastropoda			Zalipais	
Haminoea maugeansis	Gastropoda	Cephalaspidea	Haminoeidae	Haminoea	
Calliostoma (Fautor) legrandi	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Oxynoe viridis	Gastropoda		Oxynoidae	Oxynoe	Sea Slug
Sclerodoris tarka	Gastropoda	Nudibranchia	Discodorididae	Sclerodoris	Dorid Nudibranch
Calliostoma (Fautor) hedleyi	Gastropoda		Calliostomatidae	Calliostoma	Hedley's Top Shell
Amalda petterdi	Gastropoda	Hypsogastropoda	Olividae	Amalda	Ancilla
Batillaria australis	Gastropoda	Cerithimorpha	Batillariidae	Batillaria	Australian Mud Whelk
Isara glabra	Gastropoda	Hypsogastropoda	Mitridae	Isara	Glabra Mitre

Fusinus (Propefusus) pyrulatus	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	Flame Spindle Shell
Mitraguraleus mitralis	Gastropoda	Hypsogastropoda	Mangeliidae	Mitraguraleus	
Afrolittorina acutispira	Gastropoda	Hypsogastropoda	Littorinidae	Afrolittorina	Periwinkle
Austroliotia subquadrata	Gastropoda		Turbinidae	Austroliotia	The Squared Munditia
Microdiscula charopa	Gastropoda		Orbitestellidae	Microdiscula	Gastropod
Sukashitrochus atkinsoni	Gastropoda		Scissurellidae	Sukashitrochus	Atkinson Slit Shell
Polycera parvula	Gastropoda	Nudibranchia	Polyceridae	Polycera	Nudibranch
Caryodes dufresnii	Gastropoda	Stylommatophora	Caryodidae	Caryodes	
Chicoreus (Triplex) denudatus	Gastropoda	Hypsogastropoda	Muricidae	Chicoreus	Fronded Murex
Caldukia affinis	Gastropoda	Nudibranchia	Proctonotidae	Caldukia	Nudibranch
Siphonaria zelandica	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Fossarina (Minopa) legrandi	Gastropoda		Trochidae	Fossarina	Legrand's Top Shell
Ophicardelus ornatus	Gastropoda	Ellobiida	Ellobiidae	Ophicardelus	Air-breathing Snail
Phasianotrochus rutilus	Gastropoda		Trochidae	Phasianotrochus	Top Shell
Zeacumantus plumbeus	Gastropoda	Cerithimorpha	Batillariidae	Zeacumantus	Mud Creeper
Notocypraea declivis	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Cowrie
Berthellina citrina	Gastropoda	Pleurobranchida	Pleurobranchidae	Berthellina	Side-gill Slug
Malluvium devotus	Gastropoda	Hypsogastropoda	Hipponicidae	Malluvium	Horse Hoof Limpet
Aplysia juliana	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Sydaphera lactea	Gastropoda	Hypsogastropoda	Cancellariidae	Sydaphera	Nutmeg Shell
Amalda edithae	Gastropoda	Hypsogastropoda	Olividae	Amalda	Edith's Ancilla
Monophorus angasi	Gastropoda	Hypsogastropoda	Triphoridae	Monophorus	Angas's Triphora
Benthoxystus petterdi	Gastropoda	Hypsogastropoda	Muricidae	Benthoxystus	Murex Shell
Pisinna dubitabilis	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Glacidorbis rusticus	Gastropoda		Glacidorbidae	Glacidorbis	Freshwater Snail
Pseudamycla miltostoma	Gastropoda	Hypsogastropoda	Columbellidae	Pseudamycla	Dove Shell
Ataxocerithium serotinum	Gastropoda	Hypsogastropoda	Cerithiopsidae	Ataxocerithium	Square-mouthed Creeper
Eatoniella (Eatoniella) atropurpurea	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Laevilitorina (Macquariella) kingensis	Gastropoda	Hypsogastropoda	Littorinidae	Laevilitorina	Periwinkle
Doto cf. pita	Gastropoda	Nudibranchia	Dotidae	Doto	
Charonia lampas	Gastropoda	Hypsogastropoda	Charoniidae	Charonia	Red Whelk
Jorunna hartleyi	Gastropoda	Nudibranchia	Discodorididae	Jorunna	Dorid Nudibranch
Dentimargo kemblensis	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Alaba pulchra	Gastropoda	Cerithimorpha	Litiopidae	Alaba	Gastropod
Hedleytriphora fasciata	Gastropoda	Hypsogastropoda	Triphoridae	Hedleytriphora	Creeper
Gibberula subbulbosa	Gastropoda	Hypsogastropoda	Cystiscidae	Gibberula	Toothed Margin Shell
Anabathron (Anabathron) lene	Gastropoda	Hypsogastropoda	Anabathridae	Anabathron	Gastropod
Flabellina poenicia	Gastropoda	Nudibranchia	Flabellinidae	Flabellina	
Rissoina (Rissoina) angasii	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Prietocella barbara	Gastropoda	Stylommatophora	Hygromiidae	Prietocella	Small Pointed Snail
Clanculus aloysii	Gastropoda		Trochidae	Clanculus	Top Shell
Phyllodesmium macphersonae	Gastropoda	Nudibranchia	Facelinidae	Phyllodesmium	Nudibranch
Herpetopoma scabriuscula	Gastropoda		Chilodontidae	Herpetopoma	Scurfy Bead Shell
Deroceras reticulatum	Gastropoda	Stylommatophora	Agriolimacidae	Deroceras	Grey Field Slug
Melanochlamys queritor	Gastropoda	Cephalaspidea	Aglajidae	Melanochlamys	Sea Slug
Crassitoniella erratica	Gastropoda	Hypsogastropoda	Eatoniellidae	Crassitoniella	Gastropod
Onchidella patelloides	Gastropoda	Systellommatophora	Onchidiidae	Onchidella	
Rissoina (Rissoina) rhyllensis	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Tugali cicatricosa	Gastropoda		Fissurellidae	Tugali	Shield Limpet
Badepigrus pupoideus	Gastropoda	Hypsogastropoda	Anabathridae	Badepigrus	

Fossarina (Fossarina) petterdi	Gastropoda		Trochidae	Fossarina	Petterd's Top Shell
Cantharidella picturata	Gastropoda		Trochidae	Cantharidella	Top Shell
Bulla quoyii	Gastropoda	Cephalaspidea	Bullidae	Bulla	Bubble Shell
Diala megapicalis	Gastropoda	Cerithimorpha	Dialidae	Diala	Gastropod
Cumia bednalli	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	Whelk
Limax maximus	Gastropoda	Stylommatophora	Limacidae	Limax	Leopard Slug
Elsothera funerea	Gastropoda	Stylommatophora	Charopidae	Elsothera	Grim Reaper Pinwheel Snail
Verconia verconis	Gastropoda	Nudibranchia	Chromodorididae	Verconia	Nudibranch
Splendrillia woodsi	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Emarginula (Emarginula) bajula	Gastropoda		Fissurellidae	Emarginula	Delicate Slit-limpet
Tritia ephamilla	Gastropoda	Hypsogastropoda	Nassariidae	Tritia	Dog Whelk
Emmalena tumidula	Gastropoda	Stylommatophora	Rhytididae	Emmalena	Limestone Coast Carnivorous Snail
Tubulophilinopsis lineolata	Gastropoda	Cephalaspidea	Aglajidae	Tubulophilinopsis	Sea Slug
Zemira australis	Gastropoda	Hypsogastropoda	Pseudolividae	Zemira	Gastropod
Scelidoropa officeri	Gastropoda	Stylommatophora	Charopidae	Scelidoropa	Circular Head Pinwheel Snail
Opalia granosa	Gastropoda	Hypsogastropoda	Epitoniidae	Opalia	Granose Wentletrap
Madrella sanguinea	Gastropoda	Nudibranchia	Madrellidae	Madrella	Nudibranch
Sinum zonale	Gastropoda	Hypsogastropoda	Naticidae	Sinum	Sand Snail
Elysia coodgeensis	Gastropoda		Plakobranchidae	Elysia	Sea Slug
Neverita aulacoglossa	Gastropoda	Hypsogastropoda	Naticidae	Neverita	Sand Snail
Cumia mestayerae	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	Whelk
Reticunassa compacta	Gastropoda	Hypsogastropoda	Nassariidae	Reticunassa	Dog Whelk
Noumea haliclona	Gastropoda	Nudibranchia	Chromodorididae	Noumea	
Dentimargo mayii	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Hoplodoris nodulosa	Gastropoda	Nudibranchia	Discodorididae	Hoplodoris	
Sydaphera undulata	Gastropoda	Hypsogastropoda	Cancellariidae	Sydaphera	Waved Cross-barred Shell
Gabrielona nepeanensis	Gastropoda		Turbinidae	Gabrielona	Gastropod
Costatophora granifera	Gastropoda	Hypsogastropoda	Triphoridae	Costatophora	Creeper
Turbo (Carswellena) gruneri	Gastropoda		Turbinidae	Turbo	Turban Shell
Gazameda tasmanica	Gastropoda	Cerithimorpha	Turritellidae	Gazameda	Screw Shell
Cirsonella weldii	Gastropoda		Skeneidae	Cirsonella	Stout Shiny Liotia
Cernuella virgata	Gastropoda	Stylommatophora	Hygromiidae	Cernuella	Vineyard Snail
Anabathron (Anabathron) contabulatum	Gastropoda	Hypsogastropoda	Anabathridae	Anabathron	Gastropod
Ethminolia vitiliginea	Gastropoda		Trochidae	Ethminolia	Top Shell
Aclophoropsis festiva	Gastropoda	Hypsogastropoda	Triphoridae	Aclophoropsis	Creeper
Polinices (Glossaulax) incei	Gastropoda	Hypsogastropoda	Naticidae	Polinices	Ince's Moon Snail
Charisma josephi	Gastropoda		Trochidae	Charisma	Joseph's Charisma
Facelina hartleyi	Gastropoda	Nudibranchia	Facelinidae	Facelina	Nudibranch
Retusa pelyx	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Sukashitrochus pulcher	Gastropoda		Scissurellidae	Sukashitrochus	Beautiful Slit Shell
Bathytoma (Micantapex) agnata	Gastropoda	Hypsogastropoda	Borsoniidae	Bathytoma	Gastropod
Colpospira (Acutospira) atkinsoni	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Hedleytriphora basimacula	Gastropoda	Hypsogastropoda	Triphoridae	Hedleytriphora	Creeper
Neodoris chrysoderma	Gastropoda	Nudibranchia	Dorididae	Neodoris	
Phasianotrochus apicinus	Gastropoda		Trochidae	Phasianotrochus	Pointed Kelp Shell
Cystiscus obesulus	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Austrosassia parkinsonia	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Doriopsilla peculiaris	Gastropoda	Nudibranchia	Dendrodorididae	Doriopsilla	Nudibranch
Petaloconchus caperatus	Gastropoda	Hypsogastropoda	Vermetidae	Petaloconchus	Worm Shell
Rissoina (Rissoina) elegantula	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid

Nevia spirata	Gastropoda	Hypsogastropoda	Cancellariidae	Nevia	Spirate Cross-barred Shell
Brookula angeli	Gastropoda			Brookula	Gastropod
Mesoginella inconspicua	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Vexillum (Costellaria) acromiale	Gastropoda	Hypsogastropoda	Costellariidae	Vexillum	Costellate Mitre Shell
Argobuccinum pustulosum	Gastropoda	Hypsogastropoda	Cymatiidae	Argobuccinum	
Putilla porcellana	Gastropoda			Putilla	Gastropod
Edenttellina typica	Gastropoda		Juliidae	Edenttellina	
Hydrococcus brazieri	Gastropoda	Hypsogastropoda	Hydrococcidae	Hydrococcus	Snail
Austromitra tasmanica	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Mulathena fordei	Gastropoda	Stylommatophora	Charopidae	Mulathena	
Turbonilla mariae	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Sagaminopteron ornatum	Gastropoda	Cephalaspidea	Gastropteridae	Sagaminopteron	Bat-wing Seaslug
Ferrissia (Pettancylus) tasmanicus	Gastropoda		Planorbidae	Ferrissia	
Nassarius (Plicarcularia) jonasii	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Jonas's Dog Whelk
Babelomurex (Babelomurex) lischkeanus	Gastropoda	Hypsogastropoda	Muricidae	Babelomurex	Coral Shell
Facelina newcombi	Gastropoda	Nudibranchia	Facelinidae	Facelina	Nudibranch
Rostanga calumus	Gastropoda	Nudibranchia	Discodorididae	Rostanga	Dorid Nudibranch
Crassitoniella flammea	Gastropoda	Hypsogastropoda	Eatoniellidae	Crassitoniella	Gastropod
Puncturella (Puncturella) harrissoni	Gastropoda		Fissurellidae	Puncturella	Keyhole Limpet
Eatoniella (Eatoniella) galbinia	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Seila albosutura	Gastropoda	Hypsogastropoda	Cerithiopsidae	Seila	Creeper
Doto pita	Gastropoda	Nudibranchia	Dotidae	Doto	Nudibranch
Rissoina (Rissoina) gertrudis	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Patelloida mufria	Gastropoda		Lottiidae	Patelloida	Limpet
Pisinna circumlabra	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Fusitriton magellanicus	Gastropoda	Hypsogastropoda	Cymatiidae	Fusitriton	
Pyrazus ebeninus	Gastropoda	Cerithimorpha	Batillariidae	Pyrazus	Hercules Club Whelk
Austropyrgus rectus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Austrorhytida lamproides	Gastropoda	Stylommatophora	Rhytididae	Austrorhytida	Keeled Carnivorous Snail
Tularia bractea	Gastropoda	Nudibranchia	Flabellinidae	Tularia	Nudibranch
Conus (Austroconus) clarus	Gastropoda	Hypsogastropoda	Conidae	Conus	Segrave'sp. Cone
Lehmannia nyctelia	Gastropoda	Stylommatophora	Limacidae	Lehmannia	Striped Field Slug
Monophorus nigrofuscus	Gastropoda	Hypsogastropoda	Triphoridae	Monophorus	Creeper
Midorigai australis	Gastropoda		Juliidae	Midorigai	
Guraleus australis	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Friginatica beddomei	Gastropoda	Hypsogastropoda	Naticidae	Friginatica	Sand Snail
Ilbia ilbi	Gastropoda	Runcinida	Ilbiidae	Ilbia	Sea Slug
Ercolania margaritae	Gastropoda		Limapontiidae	Ercolania	Sea Slug
Obesula mamillata	Gastropoda	Hypsogastropoda	Triphoridae	Obesula	Creeper
Diodora lineata	Gastropoda		Fissurellidae	Diodora	Giant Keyhole Limpet
Alaginella gatliffi	Gastropoda	Hypsogastropoda	Marginellidae	Alaginella	Marginella
Roburnella wilsoni	Gastropoda		Oxynoidae	Roburnella	Sea Slug
Philine columnaria	Gastropoda	Cephalaspidea	Philinidae	Philine	Sea Slug
Melanella augur	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	Eulima
Bothriembryon (Bothriembryon) tasmanicus	Gastropoda	Stylommatophora	Bothriembryontidae	Bothriembryon	Tasmanian Tapered Snail
Enatimene simplex	Gastropoda	Hypsogastropoda	Muricidae	Enatimene	Murex Shell
Notoacmea corrodenda	Gastropoda		Lottiidae	Notoacmea	Limpet
Pseudoliotia micans	Gastropoda	Hypsogastropoda	Vitrinellidae	Pseudoliotia	Gastropod
Maoritomella foliacea	Gastropoda	Hypsogastropoda	Borsoniidae	Maoritomella	Turrid Shell
Ericusa papillosa	Gastropoda	Hypsogastropoda	Volutidae	Ericusa	Kenyon's Volute

Herpetopoma hamiltoni	Gastropoda		Chilodontidae	Herpetopoma	Spotted Bead Shell
Spurilla macleayi	Gastropoda	Nudibranchia	Aeolidiidae	Spurilla	
Eatoniella (Eatoniella) puniceolinea	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Antisabia erma	Gastropoda	Hypsogastropoda	Hipponicidae	Antisabia	Horse Hoof Limpet
Calliostoma (Fautor) allporti	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Paliolla cooki	Gastropoda	Nudibranchia	Polyceridae	Paliolla	Nudibranch
Fax (Scaeofax) grandior	Gastropoda	Hypsogastropoda	Buccinidae	Fax	Whelk
Austroliotia australis	Gastropoda		Turbinidae	Austroliotia	Liotine
Hallaxa michaeli	Gastropoda	Nudibranchia	Actinocyclidae	Hallaxa	Nudibranch
Ethminolia probabilis	Gastropoda		Trochidae	Ethminolia	Top Shell
Fax (Fax) tabidus	Gastropoda	Hypsogastropoda	Buccinidae	Fax	Whelk
Spectamen philippensis	Gastropoda		Solariellidae	Spectamen	
Pisinna varicifera	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Notocochlis subcostata	Gastropoda	Hypsogastropoda	Naticidae	Notocochlis	Sand Snail
Propefusus novaehollandiae	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	Spindle Shell
Turbonilla fusca	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Turbonilla beddomei	Gastropoda		Pyramidellidae	Turbonilla	
Trinchesia thelmae	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	Nudibranch
Stenacapha hamiltoni	Gastropoda	Stylommatophora	Charopidae	Stenacapha	
Lodderena minima	Gastropoda		Skeneidae	Lodderena	Gastropod
Hypselodoris bennetti	Gastropoda	Nudibranchia	Chromodorididae	Hypselodoris	Nudibranch
Epitonium (Lamelliscala) minorum	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Emarginula (Emarginula) superba	Gastropoda		Fissurellidae	Emarginula	Slit Limpet
Victaphanta milligani	Gastropoda	Stylommatophora	Rhytididae	Victaphanta	Milligan's Carnivorous Snail
Merelina hirta	Gastropoda	Hypsogastropoda	Rissoidae	Merelina	Rissoid
Tornatina apicina	Gastropoda	Cephalaspidea	Cylichnidae	Tornatina	
Goniodoris meracula	Gastropoda	Nudibranchia	Goniodorididae	Goniodoris	Nudibranch
Tenagodus weldii	Gastropoda	Cerithimorpha	Siliquariidae	Tenagodus	Sponge Worm Shell
Truncatella scalarina	Gastropoda	Hypsogastropoda	Truncatellidae	Truncatella	Gastropod
Ovaginella pisum	Gastropoda	Hypsogastropoda	Marginellidae	Ovaginella	
Nassarius (Hima) mobilis	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Dog Whelk
Seila crocea	Gastropoda	Hypsogastropoda	Cerithiopsidae	Seila	Creeper
Austroginella tasmanica	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Tasmanian Margin Shell
Austrotriton subdistortus	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Propefusus undulatus	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	Whelk
Serrata mustelina	Gastropoda	Hypsogastropoda	Marginellidae	Serrata	Marginella
Anteaeolidiella lurana	Gastropoda	Nudibranchia	Aeolidiidae	Anteaeolidiella	Nudibranch
Aplysiopsis formosa	Gastropoda		Hermaeidae	Aplysiopsis	Sea Slug
Brookula crebresculpta	Gastropoda			Brookula	Gastropod
Mitromorpha alba	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Paramontana rufozonata	Gastropoda	Hypsogastropoda	Raphitomidae	Paramontana	Turrid Shell
Janolus cf. hyalinus	Gastropoda	Nudibranchia	Proctonotidae	Janolus	
Propebela costatus	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Isotriphora tasmanica	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	Creeper
Chromodoris ambigua	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	Nudibranch
Rissoella (Jeffreysiella) wilfredi	Gastropoda		Rissoellidae	Rissoella	Gastropod
Filodrillia ordinata	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Strangesta gawleri	Gastropoda	Stylommatophora	Rhytididae	Strangesta	Gawler Carnivorous Snail
Clanculus philippi	Gastropoda		Trochidae	Clanculus	Top Shell
Pisinna tasmanica	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod

Trimusculus conica	Gastropoda	Ellobiida	Trimusculidae	Trimusculus	Air-breathing Limpet
Aegires exeches	Gastropoda	Nudibranchia	Aegiridae	Aegires	Nudibranch
Etrema (Etrema) bicolor	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Austropyrgus otwayensis	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Alaginella vercoi	Gastropoda	Hypsogastropoda	Marginellidae	Alaginella	Marginella
Hastula brazieri	Gastropoda	Hypsogastropoda	Terebridae	Hastula	Auger Shell
Paracuneus immaculatus	Gastropoda	Hypsogastropoda	Drilliidae	Paracuneus	Turrid Shell
Aeolidiella drusilla	Gastropoda	Nudibranchia	Aeolidiidae	Aeolidiella	Nudibranch
Pseudopisinna gregaria	Gastropoda	Hypsogastropoda	Cingulopsidae	Pseudopisinna	Gastropod
Coxiella (Coxiella) striata	Gastropoda	Hypsogastropoda	Tomichiidae	Coxiella	Salt Lake Snail
Austroginella muscaria	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Marginella
Arion ater	Gastropoda	Stylommatophora	Arionidae	Arion	
Colpospira (Platycolpus) quadrata	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Trinchesia viridiana	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	Nudibranch
Pugillaria stowae	Gastropoda		Siphonariidae	Pugillaria	Air-breathing Limpet
Austroginella formicula	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Marginella
Anabathron (Scrobs) luteofuscus	Gastropoda	Hypsogastropoda	Anabathridae	Anabathron	Gastropod
Adelphotectonica reevei	Gastropoda		Architectonicidae	Adelphotectonica	Staircase Shell
Cryptassiminea tasmanica	Gastropoda	Hypsogastropoda	Assimineidae	Cryptassiminea	Gastropod
Lyria (Mitraelyria) mitraeformis	Gastropoda	Hypsogastropoda	Volutidae	Lyria	Lyre Shell
Gymnodoris alba	Gastropoda	Nudibranchia	Polyceridae	Gymnodoris	Nudibranch
Livonia roadnightae	Gastropoda	Hypsogastropoda	Volutidae	Livonia	Volute
Retusa atkinsoni	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Orbitestella bastowi	Gastropoda		Orbitestellidae	Orbitestella	Gastropod
Pisinna olivacea	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Tenguella marginalba	Gastropoda	Hypsogastropoda	Muricidae	Tenguella	Kuchikire-reishi-damashi
Cinctiuga diaphana	Gastropoda		Pyramidellidae	Cinctiuga	Gastropod
Mesoginella olivella	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Cystiscus minutissima	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Mesoginella strangei	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Cacozeliana icarus	Gastropoda	Cerithimorpha	Cerithiidae	Cacozeliana	Creeper
Tayuva lilacina	Gastropoda	Nudibranchia	Discodorididae	Tayuva	Nudibranch
Eatoniella (Eatoniella) depressa	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Dentimargo gabrieli	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	
Montfortia subemarginata	Gastropoda		Fissurellidae	Montfortia	Emarginata Slit-limpet
Runcina australis	Gastropoda	Runcinida	Runcinidae	Runcina	Sea Slug
Amalda oblonga	Gastropoda	Hypsogastropoda	Olividae	Amalda	Ancilla
Styliferina translucida	Gastropoda	Cerithimorpha	Litiopidae	Styliferina	
Anachis cominellaeformis	Gastropoda	Hypsogastropoda	Columbellidae	Anachis	Dove Shell
Clanculus dunkeri	Gastropoda		Trochidae	Clanculus	Top Shell
Glyptophysa (Glyptophysa) gibbosa	Gastropoda		Planorbidae	Glyptophysa	Freshwater Snail
Cupidoliva nympha	Gastropoda	Hypsogastropoda	Olividae	Cupidoliva	Nymph Rice Shell
Chromodoris epicuria	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	
Cystopelta petterdi	Gastropoda	Stylommatophora	Cystopeltidae	Cystopelta	
Dentimitrella tayloriana	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	
Scalenostoma lodderae	Gastropoda	Hypsogastropoda	Eulimidae	Scalenostoma	Eulima
Pusillina (Haurakia) discrepans	Gastropoda	Hypsogastropoda	Rissoidae	Pusillina	
Sigapatella hedleyi	Gastropoda	Hypsogastropoda	Calyptraeidae	Sigapatella	Slipper Limpet
Ferrissia (Pettancylus) petterdi	Gastropoda		Planorbidae	Ferrissia	
Cryptassiminea buccinoides	Gastropoda	Hypsogastropoda	Assimineidae	Cryptassiminea	Gastropod

Austrocochlea brevis	Gastropoda		Trochidae	Austrocochlea	Periwinkle
Botelloides bassianus	Gastropoda		Trochidae	Botelloides	Top Shell
Verconia closeorum	Gastropoda	Nudibranchia	Chromodorididae	Verconia	Nudibranch
Alaginella geminata	Gastropoda	Hypsogastropoda	Marginellidae	Alaginella	Marginella
Rolandiella umbilicata	Gastropoda	Hypsogastropoda	Muricidae	Rolandiella	Umbilicated Murex
Eutriphora armillata	Gastropoda	Hypsogastropoda	Triphoridae	Eutriphora	Creeper
Physa acuta	Gastropoda		Physidae	Physa	
Sassia bassi	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Bass's Triton
Sinezona beddomei	Gastropoda		Scissurellidae	Sinezona	Slit Shell
Digidentis perplexa	Gastropoda	Nudibranchia	Chromodorididae	Digidentis	
Siphonochelus (Siphonochelus) syringianus	Gastropoda	Hypsogastropoda	Muricidae	Siphonochelus	Piped Cyphonochelus
Colpospira (Colpospira) wollumbi	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Lamellaria australis	Gastropoda	Hypsogastropoda	Velutinidae	Lamellaria	Gastropod
Turbonilla acicularis	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Crimora multidigitalis	Gastropoda	Nudibranchia	Polyceridae	Crimora	Nudibranch
Minolops arata	Gastropoda		Solariellidae	Minolops	Top Shell
Neverita didyma	Gastropoda	Hypsogastropoda	Naticidae	Neverita	Sand Snail
Mnestia arachis	Gastropoda	Cephalaspidea	Haminoeidae	Mnestia	Bubble Shell
Heliconoides inflatus	Gastropoda	Pteropoda	Limacinidae	Limacina	Shelled Pteropod
Microvoluta australis	Gastropoda	Hypsogastropoda	Volutomitridae	Microvoluta	Volutomitrid
Vaceuchelus profundior	Gastropoda		Chilodontidae	Vaceuchelus	Gastropod
Vacerrena kesteveni	Gastropoda		Fissurellidae	Vacerrena	
Monoplex parthenopeus	Gastropoda	Hypsogastropoda	Cymatiidae	Monoplex	Hairy Whelk
Dentimargo allporti	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Crepidula immersa	Gastropoda	Hypsogastropoda	Calyptraeidae	Crepidula	Southern Slipper Limpet
Merelina cancellata	Gastropoda	Hypsogastropoda	Rissoidae	Merelina	Rissoid
Epigrus cylindracea	Gastropoda	Hypsogastropoda	Epigridae	Epigrus	Gastropod
Etrema (Etrema) levicosta	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Gymnodoris arnoldi	Gastropoda	Nudibranchia	Polyceridae	Gymnodoris	Nudibranch
Duplicaria kieneri	Gastropoda	Hypsogastropoda	Terebridae	Duplicaria	Auger Shell
Eulima augur	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	
Splendrillia nenia	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Euterebra tristis	Gastropoda	Hypsogastropoda	Terebridae	Euterebra	Auger Shell
Bouchetriphora pallida	Gastropoda	Hypsogastropoda	Triphoridae	Bouchetriphora	Creeper
Eatoniella (Eatoniella) exigua	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Chromodoris tasmaniensis	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	
Typhis (Typhis) phillipensis	Gastropoda	Hypsogastropoda	Muricidae	Typhis	Murex Shell
Pisinna tumida	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Splendrillia eburnea	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Pisinna costata	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Haliotis coccoradiata	Gastropoda		Haliotidae	Haliotis	Scarlet-rayed Ear Shell
Candidula intersecta	Gastropoda	Stylommatophora	Hygromiidae	Candidula	
Alaginella malina	Gastropoda	Hypsogastropoda	Marginellidae	Alaginella	Marginella
Paramontana modesta	Gastropoda	Hypsogastropoda	Raphitomidae	Paramontana	Turrid Shell
Trapania benni	Gastropoda	Nudibranchia	Goniodorididae	Trapania	Nudibranch
Cymatiella sexcostata	Gastropoda	Hypsogastropoda	Cymatiidae	Cymatiella	Triton Shell
Colpospira (Ctenocolpus) australis	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Colpospira (Colpospira) runcinata	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Nodilittorina pyramidalis	Gastropoda	Hypsogastropoda	Littorinidae	Nodilittorina	Pyramid Nodiwink
Pyreneola lurida	Gastropoda	Hypsogastropoda	Columbellidae	Pyreneola	Dove Shell

Thorunna perplexa	Gastropoda	Nudibranchia	Chromodorididae	Thorunna	Nudibranch
Baeolidia macleayi	Gastropoda	Nudibranchia	Aeolidiidae	Spurilla	Nudibranch
Coralliophila sertata	Gastropoda	Hypsogastropoda	Muricidae	Coralliophila	Coral Shell
Trapania aureopunctata	Gastropoda	Nudibranchia	Goniodorididae	Trapania	Nudibranch
Eatoniella (Eatoniella) atrella	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Microcolus dunkeri	Gastropoda	Hypsogastropoda	Fasciolariidae	Microcolus	Spindle Shell
Philinopsis speciosa	Gastropoda	Cephalaspidea	Aglajidae	Philinopsis	Sea Slug
Polycera melanosticta	Gastropoda	Nudibranchia	Polyceridae	Polycera	Nudibranch
Munditia tasmanica	Gastropoda		Turbinidae	Munditia	Tasmanian Liotia
Pusillina (Haurakia) angulata	Gastropoda	Hypsogastropoda	Rissoidae	Pusillina	
Pisinna frauenfeldi	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Austropyrgus angasi	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobiid Snail
Merelina cheilostoma	Gastropoda	Hypsogastropoda	Rissoidae	Merelina	Rissoid
Asteracmea crebristriata	Gastropoda		Lottiidae	Asteracmea	Limpet
Amphithalamus (Amphithalamus) jacksoni	Gastropoda	Hypsogastropoda	Anabathridae	Amphithalamus	Gastropod
Eulima joshuana	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	
Epidirella xanthophaes	Gastropoda	Hypsogastropoda	Turridae	Epidirella	Turrid Shell
Adamnestia arachis	Gastropoda	Cephalaspidea	Cylichnidae	Adamnestia	
Guraleus tasmantis	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Ancula mapae	Gastropoda	Nudibranchia	Goniodorididae	Ancula	Nudibranch
Baeolidia australis	Gastropoda	Nudibranchia	Aeolidiidae	Baeolidia	Nudibranch
Placida dendritica	Gastropoda		Limapontiidae	Placida	Sea Slug
Elysia furvacauda	Gastropoda		Plakobranchidae	Elysia	Seaslug
Umbraculum umbraculum	Gastropoda	Umbraculida	Umbraculidae	Umbraculum	Umbrella Shell
Alvania (Linemera) filocincta	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Macteola anomala	Gastropoda	Hypsogastropoda	Mangeliidae	Macteola	Beaded Turrid
Amphithalamus (Amphithalamus) pyramis	Gastropoda	Hypsogastropoda	Anabathridae	Amphithalamus	Gastropod
Domiporta strangei	Gastropoda	Hypsogastropoda	Mitridae	Domiporta	
Epideira gabensis	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Cystiscus connectans	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Livonia mammilla	Gastropoda	Hypsogastropoda	Volutidae	Livonia	False Melon Shell
Pseudoskenella depressa	Gastropoda		Pyramidellidae	Pseudoskenella	Gastropod
Diacria trispinosa	Gastropoda	Pteropoda	Cavoliniidae	Diacria	Shelled Pteropod
Asperdaphne (Asperdaphne) tasmanica	Gastropoda	Hypsogastropoda	Raphitomidae	Asperdaphne	Turrid Shell
Aplysia sowerbyi	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Conuber melastomus	Gastropoda	Hypsogastropoda	Naticidae	Conuber	Sand Snail
Austroliotia botanica	Gastropoda		Turbinidae	Austroliotia	Liotine
Cymatiella columnaria	Gastropoda	Hypsogastropoda	Cymatiidae	Cymatiella	Triton Shell
Fusinus (Fusinus) annae	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	Spindle Shell
Tanea luculenta	Gastropoda	Hypsogastropoda	Naticidae	Tanea	
Austropyrgus rectoides	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Thordisa verrucosa	Gastropoda	Nudibranchia	Discodorididae	Thordisa	Nudibranch
Eutriphora tricolor	Gastropoda	Hypsogastropoda	Triphoridae	Eutriphora	Creeper
Tylodina corticalis	Gastropoda	Umbraculida	Tylodinidae	Tylodina	Umbrella Shell
Hedleytriphora scitula	Gastropoda	Hypsogastropoda	Triphoridae	Hedleytriphora	Creeper
Philippia lutea	Gastropoda		Architectonicidae	Philippia	Sundial Shell
Cavolinia tridentata	Gastropoda	Pteropoda	Cavoliniidae	Cavolinia	Shelled Pteropod
Austroliotia densilineata	Gastropoda		Turbinidae	Austroliotia	Close Lined Austroliotia
Glyptozaria opulenta	Gastropoda	Cerithimorpha	Cerithiidae	Glyptozaria	Opulent Screw Shell
Marita compta	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	

Propebela emina	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Brookula nepeanensis	Gastropoda			Brookula	Gastropod
Nototriphora regina	Gastropoda	Hypsogastropoda	Triphoridae	Nototriphora	Creeper
Volvarina hedleyi	Gastropoda	Hypsogastropoda	Marginellidae	Volvarina	Marginella
Laevilitorina (Laevilitorina) bruniensis	Gastropoda	Hypsogastropoda	Littorinidae	Laevilitorina	
Helicarion mastersi	Gastropoda	Stylommatophora	Helicarionidae	Helicarion	Royal Semi-slug
Elysia maoria	Gastropoda		Plakobranchidae	Elysia	Sea Slug
Cingulina spina	Gastropoda		Pyramidellidae	Cingulina	Gastropod
Onoba (Onoba) agnewi	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	Rissoid
Duplicaria ustulata	Gastropoda	Hypsogastropoda	Terebridae	Duplicaria	Auger Shell
Cirsonella carinata	Gastropoda		Skeneidae	Cirsonella	Gastropod
Sassia parkinsonia	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Parkinson's Triton
Epigrus columnaria	Gastropoda	Hypsogastropoda	Epigridae	Epigrus	Gastropod
Astelena scitulum	Gastropoda		Calliostomatidae	Astelena	Elegant Astelena
Paramontana mayana	Gastropoda	Hypsogastropoda	Raphitomidae	Paramontana	Turrid Shell
Austropyrgus vulgaris	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Phasianotrochus bellulus	Gastropoda		Trochidae	Phasianotrochus	Necklace Or Elegant Kelp Shell
Janthina janthina	Gastropoda	Hypsogastropoda	Epitoniidae	Janthina	Common Violet Sea Snail
Tambja verconis	Gastropoda	Nudibranchia	Polyceridae	Tambja	Nudibranch
Arion intermedius	Gastropoda	Stylommatophora	Arionidae	Arion	Hedgehog Slug
Nassarius (Alectrion) glans	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Acorn Dog Whelk
Dentherona (Kannaropa) dispar	Gastropoda	Stylommatophora	Charopidae	Dentherona	
Tatea huonensis	Gastropoda	Hypsogastropoda	Tateidae	Tatea	Hydrobiid Snail
Thryasona diemenensis	Gastropoda	Stylommatophora	Charopidae	Thryasona	
Colpospira (Colpospira) translucida	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Phasianella variegata	Gastropoda		Turbinidae	Phasianella	Pheasant Shell
Benthoxystus columnarius	Gastropoda	Hypsogastropoda	Muricidae	Benthoxystus	Murex Shell
Mesoginella altilabra	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Mesoginella victoriae	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Alvania (Linemera) suprasculpta	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Isotriphora amethystina	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	
Pteraeolidia ianthina	Gastropoda	Nudibranchia	Facelinidae	Pteraeolidia	Nudibranch
Guraleus fascinus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Propebela subitus	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Milax gagates	Gastropoda	Stylommatophora	Milacidae	Milax	Black-keeled Slug
Eatoniella (Eatoniella) fulva	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Turbonilla hofmani	Gastropoda		Pyramidellidae	Turbonilla	
Aphelodoris rossquicki	Gastropoda	Nudibranchia	Dorididae	Aphelodoris	Nudibranch
Charisma compacta	Gastropoda		Trochidae	Charisma	Top Shell
Guraleus tasmanicus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Tiberia bifasciata	Gastropoda		Pyramidellidae	Tiberia	
Anatoma tobeyoides	Gastropoda		Anatomidae	Anatoma	Slit Shell
Propebela kingensis	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Emozamia licina	Gastropoda	Hypsogastropoda	Muricidae	Emozamia	Southern Trophon
Merelina gracilis	Gastropoda	Hypsogastropoda	Rissoidae	Merelina	Rissoid
Monoplex exaratus	Gastropoda	Hypsogastropoda	Cymatiidae	Monoplex	Ploughed Triton
Lodderia lodderae	Gastropoda	Hypsogastropoda	Vitrinellidae	Lodderia	Gastropod
Skenella castanea	Gastropoda	Hypsogastropoda	Cingulopsidae	Skenella	
Nepotilla excavata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Ataxocerithium applenum	Gastropoda	Hypsogastropoda	Cerithiopsidae	Ataxocerithium	Creeper

Coralliophila wilsoni	Gastropoda	Hypsogastropoda	Muricidae	Coralliophila	Coral Shell
Dentimitrella axiaerata	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	
Odostomia deplexa	Gastropoda		Pyramidellidae	Odostomia	Gastropod
Belloliva leucozona	Gastropoda	Hypsogastropoda	Olividae	Belloliva	White-zoned Rice Shell
Sulcerato lachryma	Gastropoda	Hypsogastropoda	Eratoidae	Sulcerato	Erato Cowry
Pugnus parvus	Gastropoda	Hypsogastropoda	Cystiscidae	Pugnus	Marginella
Austropeplea tomentosa	Gastropoda		Lymnaeidae	Austropeplea	Freshwater Snail
Aesopus pallidulus	Gastropoda	Hypsogastropoda	Columbellidae	Aesopus	Dove Shell
Tanea sagittata	Gastropoda	Hypsogastropoda	Naticidae	Tanea	Sand Snail
Belloliva triticea	Gastropoda	Hypsogastropoda	Olividae	Belloliva	Olive Shell
Sirius badius	Gastropoda	Hypsogastropoda	Capulidae	Sirius	Cap Limpet
Favartia (Murexiella) brazieri	Gastropoda	Hypsogastropoda	Muricidae	Favartia	Brazier's Murex
Leiopyrga lineolaris	Gastropoda		Trochidae	Leiopyrga	Lined Kelp Shell
Thorunna arbuta	Gastropoda	Nudibranchia	Chromodorididae	Thorunna	Nudibranch
Trivia merces	Gastropoda	Hypsogastropoda	Triviidae	Trivia	
Columbarium hedleyi	Gastropoda	Hypsogastropoda	Turbinellidae	Columbarium	Hedley's Columbaria
Dendrodoris nigra	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	Nudibranch
Austropyrgus goliathus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Merelina elegans	Gastropoda	Hypsogastropoda	Rissoidae	Merelina	Rissoid
Litozamia rudolphi	Gastropoda	Hypsogastropoda	Muricidae	Litozamia	Murex Shell
Macrozafra legrandi	Gastropoda	Hypsogastropoda	Columbellidae	Macrozafra	
Pisinna oblata	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Burnaia helicochorda	Gastropoda	Nudibranchia	Facelinidae	Burnaia	Nudibranch
Melanella tenisoni	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	
Fax (Fax) tenuicostatus	Gastropoda	Hypsogastropoda	Buccinidae	Fax	Whelk
Prolesophanta dyeri	Gastropoda	Stylommatophora	Rhytididae	Prolesophanta	Dyer's Carnivorous Snail
Tasmatica schoutanica	Gastropoda	Hypsogastropoda	Naticidae	Tasmatica	Sand Snail
Eulima petterdi	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	Eulima
Austrodrillia saxea	Gastropoda	Hypsogastropoda	Horaiclavidae	Austrodrillia	Turrid Shell
Tamanovalva babai	Gastropoda		Juliidae	Tamanovalva	
Mesoginella schoutanica	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Cystopelta bicolor	Gastropoda	Stylommatophora	Cystopeltidae	Cystopelta	
Tectonatica shorehami	Gastropoda	Hypsogastropoda	Naticidae	Tectonatica	Sand Snail
Filodrillia tricarinata	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Fusceulima jacksonensis	Gastropoda	Hypsogastropoda	Eulimidae	Fusceulima	Eulima
Leuconopsis pellucidus	Gastropoda	Ellobiida	Ellobiidae	Leuconopsis	Air-breathing Snail
Pelseneeria brunnea	Gastropoda	Hypsogastropoda	Eulimidae	Pelseneeria	Eulima
Austropyrgus spectus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Retizafra calva	Gastropoda	Hypsogastropoda	Columbellidae	Retizafra	Dove Shell
Liotella petalifera	Gastropoda			Liotella	Gastropod
Filodrillia vitrea	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Amblychilepas crucis	Gastropoda		Fissurellidae	Amblychilepas	Keyhole Limpet
Austrotriton bassi	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Austromitra legrandi	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Austromitra scita	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Leucotina micra	Gastropoda		Amathinidae	Leucotina	Gastropod
Goniobranchus tasmaniensis	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	Nudibranch
Guraleus delicatulus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	
Lunella (Ninella) torquatus	Gastropoda		Turbinidae	Lunella	Sydney Or Heavy Turban Shell
Cystiscus cratericula	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella

Colpospira (Acutospira) accisa	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Semicassis (Semicassis) thomsoni	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Thomson's Helmet
Pisinna columnaria	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	
Obesula albovittata	Gastropoda	Hypsogastropoda	Triphoridae	Obesula	Creeper
Nepotilla mimica	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Granulina elliottae	Gastropoda	Hypsogastropoda	Cystiscidae	Granulina	Marginella
Tasmeuthria kingicola	Gastropoda	Hypsogastropoda	Buccinidae	Tasmeuthria	Whelk
Oxychilus alliarius	Gastropoda	Stylommatophora	Zonitidae	Oxychilus	Garlic Snail
Diaphana tasmanica	Gastropoda	Cephalaspidea	Diaphanidae	Diaphana	Bubble Shell
Skenella voorwindei	Gastropoda	Hypsogastropoda	Cingulopsidae	Skenella	
Alvania (Alvania) hedleyi	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Austroharpa (Palamharpa) exquisita	Gastropoda	Hypsogastropoda	Harpidae	Austroharpa	Harp Shell
Hipponix conica	Gastropoda	Hypsogastropoda	Hipponicidae	Hipponix	Conical Horse-hoof / Bonnet Limpet
Eatonina (Eatonina) hutchingsae	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Aphelodoris berghi	Gastropoda	Nudibranchia	Dorididae	Aphelodoris	Nudibranch
Marita bella	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Liotella annulata	Gastropoda			Liotella	Gastropod
Gibberula diplostreptus	Gastropoda	Hypsogastropoda	Cystiscidae	Gibberula	Marginella
Attenuata schoutanica	Gastropoda	Hypsogastropoda	Rissoidae	Attenuata	Rissoid
Gatliffena fenestrata	Gastropoda	Hypsogastropoda	Columbellidae	Gatliffena	Dove Shell
Berthella serenitas	Gastropoda	Pleurobranchida	Pleurobranchidae	Berthella	
Gyraulus (Gyraulus) meridionalis	Gastropoda		Planorbidae	Gyraulus	Freshwater Snail
Rostanga australis	Gastropoda	Nudibranchia	Discodorididae	Rostanga	
Chicoreus (Triplex) damicornis	Gastropoda	Hypsogastropoda	Muricidae	Chicoreus	Long-horned Murex
Anatrophon sarmentosus	Gastropoda	Hypsogastropoda	Muricidae	Anatrophon	Murex Shell
Mesoginella translucida	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Translucent Margin Shell
Gemixystus laminatus	Gastropoda	Hypsogastropoda	Muricidae	Gemixystus	Murex Shell
Nepotilla minuta	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Terebra lauretanae	Gastropoda	Hypsogastropoda	Terebridae	Terebra	Auger Shell
Conasprella (Parviconus) rutila	Gastropoda	Hypsogastropoda	Conidae	Conasprella	Fiery-red Cone
Diala semistriata	Gastropoda	Cerithimorpha	Dialidae	Diala	Gastropod
Cumia schoutanicus	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	Whelk
Pisinna albizona	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Calopia imitata	Gastropoda	Hypsogastropoda	Calopiidae	Calopia	Gastropod
Notogibbula lehmanni	Gastropoda		Trochidae	Notogibbula	Top Shell
Asperdaphne (Asperdaphne) desalesii	Gastropoda	Hypsogastropoda	Raphitomidae	Asperdaphne	Turrid Shell
Phyllodesmium poindimiei	Gastropoda	Nudibranchia	Facelinidae	Phyllodesmium	Nudibranch
Exomilus cancellatus	Gastropoda	Hypsogastropoda	Raphitomidae	Exomilus	Turrid Shell
Pisinna megastoma	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Hinea brasiliana	Gastropoda	Cerithimorpha	Planaxidae	Hinea	Gastropod
Chromodoris cf. tasmaniensis	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	
Janthina exigua	Gastropoda	Hypsogastropoda	Epitoniidae	Janthina	Violet Snail
Megastomia simplex	Gastropoda		Pyramidellidae	Megastomia	Gastropod
Aesopus plurisulcatus	Gastropoda	Hypsogastropoda	Columbellidae	Aesopus	Dove Shell
Hydroginella columnaria	Gastropoda	Hypsogastropoda	Marginellidae	Hydroginella	Marginella
Paradrillia torquata	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	
Sacoproteus smaragdinus	Gastropoda		Limapontiidae	Sacoproteus	Seaslug
Gibberula agapeta	Gastropoda	Hypsogastropoda	Cystiscidae	Gibberula	Marginella
Pseudestea pyramidatus	Gastropoda	Hypsogastropoda	Anabathridae	Pseudestea	Gastropod
Eatoniella (Eatoniella) shepherdi	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod

Coenaculum minutulum	Gastropoda		Cimidae	Coenaculum	Gastropod
Sclerodoris trenberthi	Gastropoda	Nudibranchia	Discodorididae	Sclerodoris	Nudibranch
Emarginula (Emarginula) curvamen	Gastropoda		Fissurellidae	Emarginula	Key-hole Limpet
Mitromorpha angusta	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Zella beddomei	Gastropoda	Hypsogastropoda	Columbellidae	Zella	Dove Shell
Gyraulus (Gyraulus) isingi	Gastropoda		Planorbidae	Gyraulus	Freshwater Snail
Paradrillia coxi	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	Cox's Turrid
Cystiscus cymbalum	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Truncatella vincentiana	Gastropoda	Hypsogastropoda	Truncatellidae	Truncatella	Gastropod
Lissotesta micra	Gastropoda			Lissotesta	Gastropod
Cystiscus multidentatus	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	
Pisinna bicolor	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Munditia hedleyi	Gastropoda		Turbinidae	Munditia	Hedley's Munditia
Microvoluta royana	Gastropoda	Hypsogastropoda	Volutomitridae	Microvoluta	Volutomitrid
Parviterebra brazieri	Gastropoda	Hypsogastropoda	Columbellidae	Parviterebra	Dove Shell
Enixotrophon venustus	Gastropoda	Hypsogastropoda	Muricidae	Enixotrophon	Murex Shell
Cystiscus subauriculata	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Phasianella angasi	Gastropoda		Turbinidae	Phasianella	Pheasant Shell
Astralium tentoriiforme	Gastropoda		Turbinidae	Astralium	Star Shell
Roseomitra strangei	Gastropoda	Hypsogastropoda	Mitridae	Domiporta	Mitre Shell
Linopyrga portseaensis	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Retusa iredaleana	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Scalaronoba arenula	Gastropoda	Hypsogastropoda	Eulimidae	Scalaronoba	Gastropod
Circulus harriettae	Gastropoda	Hypsogastropoda	Vitrinellidae	Circulus	Gastropod
Crossea concinna	Gastropoda		Skeneidae	Crossea	
Munditia mayana	Gastropoda		Turbinidae	Munditia	Liotine
Cystopelta purpurea	Gastropoda	Stylommatophora	Cystopeltidae	Cystopelta	
Cylichna thetidis	Gastropoda	Cephalaspidea	Cylichnidae	Cylichna	Bubble Shell
Elysia expansa	Gastropoda		Plakobranchidae	Elysia	Sea Slug
Bonhamaropa tarravillensis	Gastropoda	Stylommatophora	Charopidae	Bonhamaropa	Tarraville Pinwheel Snail
Vaceuchelus ampullus	Gastropoda		Chilodontidae	Vaceuchelus	Gastropod
Seilarex turritelliformis	Gastropoda	Hypsogastropoda	Triphoridae	Seilarex	Creeper
Clio pyramidata	Gastropoda	Pteropoda	Cavoliniidae	Clio	Shelled Pteropod
Dentimitrella australis	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	Australian Dove Shell
Propebela howelli	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Vitreolina commensalis	Gastropoda	Hypsogastropoda	Eulimidae	Vitreolina	Eulima
Austrorhytida glaciamans	Gastropoda	Stylommatophora	Rhytididae	Austrorhytida	Kosciuszko Carnivorous Snail
Mesoginella stilla	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Microvoluta miranda	Gastropoda	Hypsogastropoda	Volutomitridae	Microvoluta	Volutomitrid
Ringicula semisculpta	Gastropoda	Ringiculida	Ringiculidae	Ringicula	Bubble Shell
Pisinna nitida	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Colpospira (Ctenocolpus) guillaumei	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	
Brookula denselaminata	Gastropoda			Brookula	
Peculator verconis	Gastropoda	Hypsogastropoda	Volutomitridae	Peculator	Volutomitrid
Eurytrochus strangei	Gastropoda		Trochidae	Eurytrochus	Top Shell
Pseudorissoina tasmanica	Gastropoda		Pyramidellidae	Pseudorissoina	Gastropod
Koloonella moniliformis	Gastropoda		Murchisonellidae	Koloonella	Gastropod
Austropyrgus niger	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobiid Snail
Sabinella munita	Gastropoda	Hypsogastropoda	Eulimidae	Sabinella	Eulima
Nozeba topaziaca	Gastropoda	Hypsogastropoda	Iravadiidae	Nozeba	Gastropod

Mysticoncha wilsoni	Gastropoda	Hypsogastropoda	Velutinidae	Mysticoncha	Wilson's Lamellaria
Phyllocoma (Galfridus) speciosa	Gastropoda	Hypsogastropoda	Muricidae	Phyllocoma	Coral Shell
Omegapilla australis	Gastropoda	Stylommatophora	Pupillidae	Omegapilla	Bronze Pupasnail
Echinopsole breviceratae	Gastropoda	Nudibranchia	Facelinidae	Echinopsole	Nudibranch
Tasmaphena sinclairi	Gastropoda	Stylommatophora	Rhytididae	Tasmaphena	Sinclair's Carnivorous Snail
Pedicamista coesus	Gastropoda	Stylommatophora	Punctidae	Pedicamista	
Pterochelus duffusi	Gastropoda	Hypsogastropoda	Muricidae	Pterochelus	Duffuse Murex
Merica purpuriformis	Gastropoda	Hypsogastropoda	Cancellariidae	Merica	Nutmeg Shell
Colpospira (Acutospira) smithiana	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Atagema albata	Gastropoda	Nudibranchia	Dorididae	Atagema	Nudibranch
Onoba (Ovirissoa) rubicunda	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	Rissoid
Naricava vincentiana	Gastropoda	Hypsogastropoda	Vanikoridae	Naricava	Gastropod
Scalaronoba kryptopleurakia	Gastropoda	Hypsogastropoda	Eulimidae	Scalaronoba	Gastropod
Pisinna vincula	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Australaria fusiformis	Gastropoda	Hypsogastropoda	Fasciolariidae	Australaria	
Natica subcostata	Gastropoda	Hypsogastropoda	Naticidae	Natica	
Scelidoropa tamarensis	Gastropoda	Stylommatophora	Charopidae	Scelidoropa	Tamar River Pinwheel Snail
Granulina nympha	Gastropoda	Hypsogastropoda	Cystiscidae	Granulina	Marginella
Rissoella (Rissoella) fallax	Gastropoda		Rissoellidae	Rissoella	Gastropod
Filodrillia mucronata	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Pelycidion eukyrtos	Gastropoda	Hypsogastropoda	Pelycidiidae	Pelycidion	Gastropod
Cominella filicea	Gastropoda	Hypsogastropoda	Buccinidae	Cominella	Whelk
Berthelinia australis	Gastropoda		Juliidae	Berthelinia	Bivalved Gastropod
Dentimargo jaffa	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Pollia bednalli	Gastropoda	Hypsogastropoda	Buccinidae	Pollia	Whelk
Astele rubiginosa	Gastropoda		Calliostomatidae	Astele	Top Shell
Propilidium tasmanicum	Gastropoda		Lepetidae	Propilidium	Limpet
Doriopsilla miniata	Gastropoda	Nudibranchia	Dendrodorididae	Doriopsilla	Nudibranch
Hydroginella mixta	Gastropoda	Hypsogastropoda	Marginellidae	Hydroginella	Marginella
Mexichromis macropus	Gastropoda	Nudibranchia	Chromodorididae	Mexichromis	Nudibranch
Trinchesia kuiteri	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	
Melibe australis	Gastropoda	Nudibranchia	Tethydidae	Melibe	Nudibranch
Meredithena dandenongensis	Gastropoda	Stylommatophora	Charopidae	Meredithena	Dandenong Ranges Pinwheel Snail
Microcarina surgerea	Gastropoda			Microcarina	
Microxeromagna lowei	Gastropoda	Stylommatophora	Hygromiidae	Microxeromagna	Citrus Snail
Tasmaphena ruga	Gastropoda	Stylommatophora	Rhytididae	Tasmaphena	Coarse-ribbed Carnivorous Snail
Puncturella (Cranopsis) corolla	Gastropoda		Fissurellidae	Puncturella	The Crown Puncturella
Solatisonax injussa	Gastropoda		Architectonicidae	Solatisonax	Staircase Shell
Trocholaoma parvissima	Gastropoda	Stylommatophora	Punctidae	Trocholaoma	Tiny Pinhead Snail
Dermomurex (Dermomurex) goldsteini	Gastropoda	Hypsogastropoda	Muricidae	Dermomurex	Goldstein's Trophon
Syrnola tincta	Gastropoda		Pyramidellidae	Syrnola	Gastropod
Chromodoris tinctoria	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	
Gemixystus recurvatus	Gastropoda	Hypsogastropoda	Muricidae	Gemixystus	Recurved Benthoxystus
Dendropoma nucleocostatum	Gastropoda	Hypsogastropoda	Vermetidae	Dendropoma	Worm Shell
Leucotina casta	Gastropoda		Amathinidae	Leucotina	Gastropod
Paradrillia garrardi	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	
Powellisetia simillima	Gastropoda	Hypsogastropoda	Rissoidae	Powellisetia	Rissoid
Onoba (Subestea) supracostata	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	
Siphonaria denticulata	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Socienna trisculpta	Gastropoda	Hypsogastropoda	Cerithiopsidae	Socienna	Creeper

Epideira candida	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Exomilus telescopialis	Gastropoda	Hypsogastropoda	Raphitomidae	Exomilus	Turrid Shell
Rissoina (Moerchiella) dorbignyi	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Colpospira (Colpospira) decoramen	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Calliostoma (Fautor) comptum	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Scelidoropa gatliffi	Gastropoda	Stylommatophora	Charopidae	Scelidoropa	Gatliffâ€™s Pinwheel Snail
Dendrodoris maugeana	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	Nudibranch
Nepotilla carinata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Lironoba unilirata	Gastropoda	Hypsogastropoda	Rissoidae	Lironoba	Rissoid
Onoba (Ovirissoa) perpolita	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	Rissoid
Badepigrus badia	Gastropoda	Hypsogastropoda	Anabathridae	Badepigrus	Gastropod
Melanochlamys handrecki	Gastropoda	Cephalaspidea	Aglajidae	Melanochlamys	Sea Slug
Eatonina (Eatonina) condita	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Aesopus jaffaensis	Gastropoda	Hypsogastropoda	Columbellidae	Aesopus	Dove Shell
Guraleus incrusta	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Berthelinia typica	Gastropoda		Juliidae	Berthelinia	Bivalved Gastropod
Limacina lesueurii	Gastropoda	Pteropoda	Limacinidae	Limacina	Shelled Pteropod
Digidentis arbuta	Gastropoda	Nudibranchia	Chromodorididae	Digidentis	
Orbitestella decorata	Gastropoda		Orbitestellidae	Orbitestella	Gastropod
Rissoella (Jeffreysiella) fretterae	Gastropoda		Rissoellidae	Rissoella	Gastropod
Limacus flavus	Gastropoda	Stylommatophora	Limacidae	Limacus	Yellow Cellar Slug
Pseudorissoina capiticava	Gastropoda		Pyramidellidae	Pseudorissoina	Gastropod
Ollaphon molorthus	Gastropoda	Hypsogastropoda	Muricidae	Ollaphon	Whelk
Dendrodoris albopurpura	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	Nudibranch
Aesopus solidus	Gastropoda	Hypsogastropoda	Columbellidae	Aesopus	Dove Shell
Oxymeris albida	Gastropoda	Hypsogastropoda	Terebridae	Oxymeris	Auger Shell
Dolicholatirus spiceri	Gastropoda	Hypsogastropoda	Fasciolariidae	Dolicholatirus	Sapphire Spindle Shell
Icuncula torcularis	Gastropoda	Hypsogastropoda	Capulidae	Icuncula	Gastropod
Fossarina (Fossarina) patula	Gastropoda		Trochidae	Fossarina	Top Shell
Guraleus flaccidus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Excellaoma retipora	Gastropoda	Stylommatophora	Charopidae	Excellaoma	
Alaginella ochracea	Gastropoda	Hypsogastropoda	Marginellidae	Alaginella	Marginella
Acanthodoris nanega	Gastropoda	Nudibranchia	Onchidorididae	Acanthodoris	Nudibranch
Semicassis (Semicassis) labiata	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Helmet Shell
Teleochilus royanus	Gastropoda	Hypsogastropoda	Raphitomidae	Teleochilus	Turrid Shell
Cylichnatys campanula	Gastropoda	Cephalaspidea	Haminoeidae	Cylichnatys	Bubble Shell
Oocorys sulcata	Gastropoda	Hypsogastropoda	Cassidae	Oocorys	Helmet Shell
Zaclys semilaevis	Gastropoda	Hypsogastropoda	Cerithiopsidae	Zaclys	Creeper
Fusceulima perexigua	Gastropoda	Hypsogastropoda	Eulimidae	Fusceulima	
Tonna tankervillii	Gastropoda	Hypsogastropoda	Tonnidae	Tonna	Tun Shell
Mesoginella consobrina	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Austropyrgus foris	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Phos (Phos) senticosus	Gastropoda	Hypsogastropoda	Nassariidae	Phos	Whelk
Clanculus floridus	Gastropoda		Trochidae	Clanculus	Top Shell
Liotella johnstoni	Gastropoda			Liotella	Gastropod
Guraleus cuspis	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Macroschisma producta	Gastropoda		Fissurellidae	Macroschisma	Keyhole Limpet
Rissoina (Rissoina) ferruginea	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Hinemoa suprasculpta	Gastropoda		Pyramidellidae	Hinemoa	
Scissurella cyprina	Gastropoda		Scissurellidae	Scissurella	Venus Slit Shell

Clanculus brunneus	Gastropoda		Trochidae	Clanculus	Top Shell
Asperdaphne (Aspertilla) legrandi	Gastropoda	Hypsogastropoda	Raphitomidae	Asperdaphne	Turrid Shell
Chrysallida mayii	Gastropoda		Pyramidellidae	Chrysallida	Gastropod
Noalda exigua	Gastropoda	Cephalaspidea	Aglajidae	Noalda	Sea Slug
Daphnella (Daphnella) botanica	Gastropoda	Hypsogastropoda	Raphitomidae	Daphnella	Botany Bay Turrid
Austroginella praetermissa	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Marginella
Fusinus (Fusinus) australis	Gastropoda	Hypsogastropoda	Fasciolariidae	Fusinus	Southern Spindle
Nanula tasmanica	Gastropoda		Trochidae	Nanula	Top Shell
Amblychilepas omicron	Gastropoda		Fissurellidae	Amblychilepas	Keyhole Limpet
Enixotrophon carduelis	Gastropoda	Hypsogastropoda	Muricidae	Enixotrophon	Murex Shell
Sassia garrardi	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	
Rissoella (Zelaxitas) micra	Gastropoda		Rissoellidae	Rissoella	Gastropod
Euterebra assecla	Gastropoda	Hypsogastropoda	Terebridae	Euterebra	Auger Shell
Polinices (Glossaulax) didyma	Gastropoda	Hypsogastropoda	Naticidae	Polinices	Bladder Moon Snail
Nepotilla triseriata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Filodrillia lacteola	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Eubranchus rubeolus	Gastropoda	Nudibranchia	Eubranchidae	Eubranchus	Nudibranch
Colpospira (Acutospira) yarramundi	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Liotella compacta	Gastropoda			Liotella	Gastropod
Rissoina (Rissoina) royana	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Splendrillia lygdina	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Retizafra multicostata	Gastropoda	Hypsogastropoda	Columbellidae	Retizafra	Dove Shell
Volvulella rostrata	Gastropoda	Cephalaspidea	Retusidae	Volvulella	Bubble Shell
Narvaliscala dorysa	Gastropoda	Hypsogastropoda	Epitoniidae	Narvaliscala	Wentletrap
Epitonium (Epitonium) bellicosum	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Turrella morologus	Gastropoda	Hypsogastropoda	Clathurellidae	Turrella	Turrid Shell
Isotriphora vercoi	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	Creeper
Tugali parmophoidea	Gastropoda		Fissurellidae	Tugali	Flat False Limpet
Naccula parva	Gastropoda		Nacellidae	Naccula	Limpet
Conuber controversa	Gastropoda	Hypsogastropoda	Naticidae	Conuber	Sand Snail
Argobuccinum tumidum	Gastropoda	Hypsogastropoda	Cymatiidae	Argobuccinum	Triton Shell
Gibberula pulchella	Gastropoda	Hypsogastropoda	Cystiscidae	Persicula	Marginella
Sacoproteus yhiae	Gastropoda		Limapontiidae	Sacoproteus	Sea Slug
Scyllaea fulva	Gastropoda	Nudibranchia	Scyllaeidae	Scyllaea	Nudibranch
Rissoina (Rissoina) iredalei	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Isotriphora nivea	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	Creeper
Cochlicella acuta	Gastropoda	Stylommatophora	Hygromiidae	Cochlicella	
Onoba (Subestea) australiae	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	
Retusa protumida	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Austropyrgus procerus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Pillomena meraca	Gastropoda	Stylommatophora	Charopidae	Pillomena	
Paradrillia suavis	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	
Conassiminea zheni	Gastropoda	Hypsogastropoda	Assimineidae	Conassiminea	Gastropod
Conasprella (Endemoconus) howelli	Gastropoda	Hypsogastropoda	Conidae	Conasprella	Cone Snail
Specula turbonilloides	Gastropoda	Hypsogastropoda	Cerithiopsidae	Specula	Creeper
Guraleus brazieri	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Okenia echinata	Gastropoda	Nudibranchia	Goniodorididae	Okenia	Nudibranch
Propescala translucida	Gastropoda	Hypsogastropoda	Epitoniidae	Propescala	Wentletrap
Apicalia brazieri	Gastropoda	Hypsogastropoda	Eulimidae	Apicalia	Brazier's Stilifer
Embletonia gracilis	Gastropoda	Nudibranchia	Embletoniidae	Embletonia	Nudibranch

Cirsonella reflecta	Gastropoda		Skeneidae	Cirsonella	Gastropod
Cryptassiminea glenelgensis	Gastropoda	Hypsogastropoda	Assimineidae	Cryptassiminea	Gastropod
Aclophoropsis maculosa	Gastropoda	Hypsogastropoda	Triphoridae	Aclophoropsis	Splashed Sinistral Creeper
Eulima acutissima	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	Eulima
Polinices (Glossaulax) aulacoglossa	Gastropoda	Hypsogastropoda	Naticidae	Polinices	
Sassia petulans	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	
Austropusilla (Austropusilla) hilum	Gastropoda	Hypsogastropoda	Raphitomidae	Austropusilla	Turrid Shell
Eucithara pagoda	Gastropoda	Hypsogastropoda	Mangeliidae	Eucithara	Gastropod
Exomilus cylindricus	Gastropoda	Hypsogastropoda	Raphitomidae	Exomilus	Turrid Shell
Dentimargo dentiens	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Platydoris galbana	Gastropoda	Nudibranchia	Discodorididae	Platydoris	Sea Slug
Anteaeolidiella foulisi	Gastropoda	Nudibranchia	Aeolidiidae	Anteaeolidiella	
Alvania (Alvania) novarensis	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	
Microdryas janjucensis	Gastropoda	Hypsogastropoda	Anabathridae	Microdryas	Gastropod
Asteracmea illibrata	Gastropoda		Lottiidae	Asteracmea	Plain Limpet
Brookula finesia	Gastropoda			Brookula	Gastropod
Onoba (Onoba) multilirata	Gastropoda	Hypsogastropoda	Rissoidae	Onoba	
Hebeulima kilcundae	Gastropoda	Hypsogastropoda	Eulimidae	Hebeulima	
Marita insculpta	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Oxychilus cellarius	Gastropoda	Stylommatophora	Zonitidae	Oxychilus	Cellar Snail
Puncturella (Puncturella) demissa	Gastropoda		Fissurellidae	Puncturella	Kehole Limpet
Cupedora extensum	Gastropoda	Stylommatophora	Camaenidae	Cupedora	
Austropyrgus macaulayi	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	
Cirsotrema martyr	Gastropoda	Hypsogastropoda	Epitoniidae	Cirsotrema	Wentletrap
Cystiscus freycineti	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Tubercliopsis cessicus	Gastropoda	Hypsogastropoda	Cerithiopsidae	Tubercliopsis	Creeper
Mathilda decorata	Gastropoda		Mathildidae	Mathilda	Gastropod
Bonhamaropa erskinensis	Gastropoda	Stylommatophora	Charopidae	Bonhamaropa	Erskine River Pinwheel Snail
Dermatobranchus rubidus	Gastropoda	Nudibranchia	Arminidae	Dermatobranchus	Nudibranch
Seila magna	Gastropoda	Hypsogastropoda	Cerithiopsidae	Seila	Creeper
Dentimitrella intexta	Gastropoda	Hypsogastropoda	Columbellidae	Dentimitrella	
Exomilus dyscritos	Gastropoda	Hypsogastropoda	Raphitomidae	Exomilus	Turrid Shell
Hinemoa ligata	Gastropoda		Pyramidellidae	Hinemoa	
Pupa tragulata	Gastropoda		Acteonidae	Pupa	Bubble Shell
Isotriphora simulata	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	Creeper
Epitonium (Papyriscala) tenellum	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Benthofascis biconica	Gastropoda	Hypsogastropoda	Conorbidae	Benthofascis	Gastropod
Monstrotyphis yatesi	Gastropoda	Hypsogastropoda	Muricidae	Monstrotyphis	Yate's Typhis
Naricava angasi	Gastropoda	Hypsogastropoda	Vanikoridae	Naricava	Gastropod
Hydroginella tridentata	Gastropoda	Hypsogastropoda	Marginellidae	Hydroginella	Marginella
Cratena lineata	Gastropoda	Nudibranchia	Facelinidae	Cratena	Nudibranch
Retizafra plexa	Gastropoda	Hypsogastropoda	Columbellidae	Retizafra	
Epideira carinata	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Cystiscus halli	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Allocharopa erskinensis	Gastropoda	Stylommatophora	Charopidae	Allocharopa	Land Snail
Danilia telebathia	Gastropoda		Chilodontidae	Danilia	Thick Lip Top Shell
Noumea sulphurea	Gastropoda	Nudibranchia	Chromodorididae	Noumea	
Gemixystus polyphyllius	Gastropoda	Hypsogastropoda	Muricidae	Gemixystus	Murex Shell
Dentimargo lodderae	Gastropoda	Hypsogastropoda	Marginellidae	Dentimargo	Marginella
Hiloa variabilis	Gastropoda		Turbinidae	Tricolia	Tricolia

Trophonopsis segmentata	Gastropoda	Hypsogastropoda	Muricidae	Trophonopsis	Whelk
Berthelinia babai	Gastropoda		Juliidae	Berthelinia	Bivalved Gastropod
Pleuroloba quoyi	Gastropoda	Ellobiida	Ellobiidae	Pleuroloba	Air-breathing Snail
Mitromorpha incerta	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Mitromorpha macphersonae	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Dolicrossea labiata	Gastropoda	Hypsogastropoda	Elachisinidae	Dolicrossea	Gastropod
Parviterebra trilineata	Gastropoda	Hypsogastropoda	Columbellidae	Parviterebra	Three Lined Auger
Balanetta baylii	Gastropoda	Hypsogastropoda	Marginellidae	Balanetta	Marginella
Filodrillia stadialis	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Onchidina australis	Gastropoda	Systellommatophora	Onchidiidae	Onchidina	Air-breathing Sea Slug
Patelloida mimula	Gastropoda		Lottiidae	Patelloida	Limpet
Anabathron (Scrobs) scrobiculator	Gastropoda	Hypsogastropoda	Anabathridae	Anabathron	Gastropod
Circulus cinguliferus	Gastropoda	Hypsogastropoda	Vitrinellidae	Circulus	Gastropod
Amphithalamus (Amphithalamus) obesus	Gastropoda	Hypsogastropoda	Anabathridae	Amphithalamus	Gastropod
Turbonilla scalpidens	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Mitromorpha columnaria	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Sinutor incertum	Gastropoda		Calliostomatidae	Sinutor	Left-handed Or Doubtful Calliostoma
Austroturris steira	Gastropoda	Hypsogastropoda	Borsoniidae	Austroturris	Turrid Shell
Notogibbula preissiana	Gastropoda		Trochidae	Notogibbula	Top Shell
Natica sticta	Gastropoda	Hypsogastropoda	Naticidae	Natica	Spotted Sand Shell
Mitromorpha costifera	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	
Omalogyra liliputia	Gastropoda		Omalogyridae	Omalogyra	Gastropod
Colpospira (Platycolpus) circumligata	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Flabellina rubrolineata	Gastropoda	Nudibranchia	Flabellinidae	Flabellina	
Xenophora (Xenophora) peroniana	Gastropoda	Hypsogastropoda	Enophoridae	Xenophora	Adorned Carrier Shell
Rissoella (Zelaxitas) imperforata	Gastropoda		Rissoellidae	Rissoella	Gastropod
Splendrillia subviridis	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Lucidestea atkinsoni	Gastropoda	Hypsogastropoda	Rissoidae	Lucidestea	Rissoid
Attenuata archensis	Gastropoda	Hypsogastropoda	Rissoidae	Attenuata	Rissoid
Turbonilla portseaensis	Gastropoda		Pyramidellidae	Turbonilla	
Aphelodoris varia	Gastropoda	Nudibranchia	Dorididae	Aphelodoris	Nudibranch
Excellaoma melbournensis	Gastropoda	Stylommatophora	Charopidae	Excellaoma	Melbourne Pinwheel Snail
Colpospira (Colpospira) sinuata	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Hydroginella vincentiana	Gastropoda	Hypsogastropoda	Marginellidae	Hydroginella	Marginella
Trinchesia cf. ornata	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	
Minolops pulcherrima	Gastropoda		Solariellidae	Minolops	
Austropyrgus glenelgensis	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Vayssierea caledonica	Gastropoda	Nudibranchia	Okadaiidae	Vayssierea	Nudibranch
Goniodoridella savignyi	Gastropoda	Nudibranchia	Goniodorididae	Goniodoridella	
Bursatella leachii	Gastropoda	Aplysiida	Aplysiidae	Bursatella	Sea Hare
Hermaea evelinemarcusae	Gastropoda		Hermaeidae	Hermaea	Sea Slug
Anabathron (Scrobs) pluteus	Gastropoda	Hypsogastropoda	Anabathridae	Anabathron	Gastropod
Filodrillia columnaria	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Astele ciliare	Gastropoda		Calliostomatidae	Astele	Calliope Top Shell
Acirsa morchi	Gastropoda	Hypsogastropoda	Epitoniidae	Acirsa	
Sydaphera anxifer	Gastropoda	Hypsogastropoda	Cancellariidae	Sydaphera	Nutmeg Shell
Seila insignis	Gastropoda	Hypsogastropoda	Cerithiopsidae	Seila	Creeper
Huntiana murrayana	Gastropoda	Stylommatophora	Charopidae	Huntiana	Murray Cliffs Pinwheel Snail
Bothriembryon (Tasmanembryon) tasmanicus	Gastropoda	Stylommatophora	Bothriembryontidae	Bothriembryon	
Glyphostoma alliteratum	Gastropoda	Hypsogastropoda	Clathurellidae	Glyphostoma	Turrid Shell

Scyllaea pelagica	Gastropoda	Nudibranchia	Scyllaeidae	Scyllaea	
Colpospira (Colpospira) cordismei	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Orbitestella iredalei	Gastropoda		Orbitestellidae	Orbitestella	
Tonna tetracotula	Gastropoda	Hypsogastropoda	Tonnidae	Tonna	Deep-water Tun
Curveulima indiscreta	Gastropoda	Hypsogastropoda	Eulimidae	Curveulima	Eulima
Retusa pygmaea	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Aplysia dactylomela	Gastropoda	Aplysiida	Aplysiidae	Aplysia	
Pleurotomella spicula	Gastropoda	Hypsogastropoda	Raphitomidae	Pleurotomella	
Agatha petterdi	Gastropoda		Pyramidellidae	Agatha	
Digidentis kulonba	Gastropoda	Nudibranchia	Chromodorididae	Digidentis	
Alcyna kingensis	Gastropoda		Trochidae	Alcyna	Top Shell
Lissotesta contabulata	Gastropoda			Lissotesta	Gastropod
Proterato denticulata	Gastropoda	Hypsogastropoda	Triviidae	Proterato	Bean Cowrie
Hemiliostraca joshuana	Gastropoda	Hypsogastropoda	Eulimidae	Hemiliostraca	Eulima
Amalda fusiformis	Gastropoda	Hypsogastropoda	Olividae	Alocospira	Ancilla
Volvarina haswelli	Gastropoda	Hypsogastropoda	Marginellidae	Volvarina	Marginella
Austromitra bellapicta	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Vexitomina radulaeformis	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	Turrid Shell
Goniobranchus tinctorius	Gastropoda	Nudibranchia	Chromodorididae	Goniobranchus	Nudibranch
Diversidoris sulphurea	Gastropoda	Nudibranchia	Chromodorididae	Diversidoris	Nudibranch
Bullastra lessoni	Gastropoda		Lymnaeidae	Austropeplea	Freshwater Snail
Isidorella hainesii	Gastropoda		Planorbidae	Isidorella	Freshwater Snail
Jorunna ramicola	Gastropoda	Nudibranchia	Discodorididae	Jorunna	Dorid Nudibranch
Cystiscus indiscreta	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Socienna cylindricum	Gastropoda	Hypsogastropoda	Cerithiopsidae	Socienna	Creeper
Cornirostra pellucida	Gastropoda		Cornirostridae	Cornirostra	
Austrorissopsis consobrina	Gastropoda	Hypsogastropoda	Eulimidae	Austrorissopsis	Gastropod
Caecum (Caecum) amputatum	Gastropoda	Hypsogastropoda	Caecidae	Caecum	Gastropod
Tubercliopsis dannevigi	Gastropoda	Hypsogastropoda	Cerithiopsidae	Tubercliopsis	Creeper
Gyraulus (Gyraulus) chinensis	Gastropoda		Planorbidae	Gyraulus	Freshwater Snail
Ascobulla fischeri	Gastropoda		Volvatellidae	Ascobulla	Sea Slug
Liocarinia disjuncta	Gastropoda		Skeneidae	Liocarinia	Gastropod
Epideira torquata	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Archidoris wellingtonensis	Gastropoda	Nudibranchia	Dorididae	Archidoris	
Allocharopa tarravillensis	Gastropoda	Stylommatophora	Charopidae	Allocharopa	
Eutriphora cana	Gastropoda	Hypsogastropoda	Triphoridae	Eutriphora	Creeper
Nipponatys tumidus	Gastropoda	Cephalaspidea	Haminoeidae	Nipponatys	
Melanella obtusa	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	Eulima
Mitromorpha paucilirata	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Liotella pulcherrima	Gastropoda			Liotella	Gastropod
Agatha australis	Gastropoda		Pyramidellidae	Agatha	Gastropod
Enixotrophon plicilaminatus	Gastropoda	Hypsogastropoda	Muricidae	Enixotrophon	Murex Shell
Nepotilla bathentoma	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Elsothera sericatula	Gastropoda	Stylommatophora	Charopidae	Elsothera	Chocolate-streaked Pinwheel Snail
Asperdaphne (Asperdaphne) bastowi	Gastropoda	Hypsogastropoda	Raphitomidae	Asperdaphne	Turrid Shell
Austropyrgus nitidus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Noumea closeorum	Gastropoda	Nudibranchia	Chromodorididae	Noumea	
Austropyrgus tumidus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Pygmipanda kershawi	Gastropoda	Stylommatophora	Caryodidae	Pygmipanda	Kershaw's Panda-snail
Typhlomangelia corona	Gastropoda	Hypsogastropoda	Borsoniidae	Typhlomangelia	Turrid Shell

Sacoproteus browni	Gastropoda		Limapontiidae	Sacoproteus	Sea Slug
Attenuata wilsonensis	Gastropoda	Hypsogastropoda	Rissoidae	Attenuata	Rissoid
Cymbiola magnifica	Gastropoda	Hypsogastropoda	Volutidae	Cymbiola	Magnificent Volute
Archiminolia oleacea	Gastropoda		Solariellidae	Archiminolia	Shining Top Shell
Hallaxa indecora	Gastropoda	Nudibranchia	Actinocyclidae	Hallaxa	
Austropyrgus gordonensis	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Melanella orthopleura	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	
Salinator tecta	Gastropoda		Amphibolidae	Salinator	Air-breathing Snail
Discocharopa aperta	Gastropoda	Stylommatophora	Charopidae	Discocharopa	Miniscule White Pinwheel Snail
Melanella mayi	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	
Eatonina (Eatonina) sanguinolenta	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Bullina lineata	Gastropoda		Bullinidae	Bullina	Bubble Shell
Anachis remoensis	Gastropoda	Hypsogastropoda	Columbellidae	Anachis	Dove Shell
Emarginula (Emarginula) gabensis	Gastropoda		Fissurellidae	Emarginula	Slit Limpet
Cylindriscala distincta	Gastropoda	Hypsogastropoda	Epitoniidae	Cylindriscala	Wentletrap
Austrocarina recta	Gastropoda	Hypsogastropoda	Horaiclavidae	Austrocarina	Turrid Shell
Apispiralia albocincta	Gastropoda	Hypsogastropoda	Mangeliidae	Apispiralia	Turrid Shell
Balanetta cylichnella	Gastropoda	Hypsogastropoda	Marginellidae	Balanetta	Marginella
Emarginula (Emarginula) incisura	Gastropoda		Fissurellidae	Emarginula	
Marita inornata	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Epideira quoyi	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Callodix solida	Gastropoda		Skeneidae	Callodix	
Lucidestea nitens	Gastropoda	Hypsogastropoda	Rissoidae	Lucidestea	Rissoid
Isidorella newcombi	Gastropoda		Planorbidae	Isidorella	Freshwater Snail
Rissoina (Rissoina) nivea	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Peasistilifer solitaria	Gastropoda	Hypsogastropoda	Eulimidae	Peasistilifer	Eulima
Attenuata praetornatilis	Gastropoda	Hypsogastropoda	Rissoidae	Attenuata	
Alvania (Linemera) verconiana	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Sassia epitrema	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	
Buccipagoda kengrahami	Gastropoda	Hypsogastropoda	Buccinidae	Buccipagoda	Whelk
Nepotilla fenestrata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Nepotilla lamellosa	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Onchidoris maugeansis	Gastropoda	Nudibranchia	Onchidorididae	Onchidoris	
Diacavolinia longirostris	Gastropoda	Pteropoda	Cavoliniidae	Diacavolinia	Shelled Pteropod
Icuncula zodiacus	Gastropoda	Hypsogastropoda	Capulidae	Icuncula	Cap Limpet
Melibe maugeana	Gastropoda	Nudibranchia	Tethydidae	Melibe	Nudibranch
Siphonaria jeanae	Gastropoda		Siphonariidae	Siphonaria	Air-breathing Limpet
Graphis pellucida	Gastropoda		Cimidae	Graphis	Gastropod
Austrorhytida capillacea	Gastropoda	Stylommatophora	Rhytididae	Austrorhytida	Common Southern Carnivorous Snail
Nepotilla diaphana	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Noumea aureopunctata	Gastropoda	Nudibranchia	Chromodorididae	Noumea	
Fascinus typicus	Gastropoda	Hypsogastropoda	Fasciolariidae	Fascinus	Whelk
Seila marmorata	Gastropoda	Hypsogastropoda	Cerithiopsidae	Seila	Creeper
Guraleus lallemantianus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Scrinium gatliffi	Gastropoda	Hypsogastropoda	Mitromorphidae	Scrinium	Turrid Shell
Prolixodens infracolor	Gastropoda	Hypsogastropoda	Cerithiopsidae	Prolixodens	Creeper
Isotriphora disjuncta	Gastropoda	Hypsogastropoda	Triphoridae	Isotriphora	Creeper
Mitromorpha multicostata	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Argalista fugitiva	Gastropoda		Turbinidae	Argalista	
Curveulima cornuta	Gastropoda	Hypsogastropoda	Eulimidae	Curveulima	Eulima

Austropeplea lessoni	Gastropoda		Lymnaeidae	Austropeplea	
Emblanda emblematica	Gastropoda	Hypsogastropoda	Emblandidae	Emblanda	Gastropod
Aesopus cassandra	Gastropoda	Hypsogastropoda	Columbellidae	Aesopus	Dove Shell
Okenia mija	Gastropoda	Nudibranchia	Goniodorididae	Okenia	Nudibranch
Anatoma gunteri	Gastropoda		Anatomidae	Anatoma	Slit Shell
Cyllene royana	Gastropoda	Hypsogastropoda	Nassariidae	Cyllene	Dog Whelk
Gibbula (Hisseyagibbula) hisseyiana	Gastropoda		Trochidae	Gibbula	Top Shell
Turritriton labiosus	Gastropoda	Hypsogastropoda	Cymatiidae	Turritriton	Full-lipped Triton
Murexsul planiliratus	Gastropoda	Hypsogastropoda	Muricidae	Murexsul	Fimbriate Murex
Microgenia edwini	Gastropoda	Hypsogastropoda	Raphitomidae	Microgenia	Turrid Shell
Exomilopsis spica	Gastropoda	Hypsogastropoda	Columbellidae	Exomilopsis	Dove Shell
Argalista kingensis	Gastropoda		Turbinidae	Argalista	Top Shell
Epideira hedleyi	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Striated Turrid
Cystiscus problematica	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Inella spina	Gastropoda	Hypsogastropoda	Triphoridae	Inella	Creeper
Epideira philipineri	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Capulus violaceus	Gastropoda	Hypsogastropoda	Capulidae	Capulus	Cap Limpet
Acteon fructuosus	Gastropoda		Acteonidae	Acteon	Bubble Shell
Kessneropa mimosa	Gastropoda	Stylommatophora	Charopidae	Kessneropa	White-rayed Pinwheel Snail
Cassis fimbriata	Gastropoda	Hypsogastropoda	Cassidae	Cassis	Bicarinated Helmet
Odostomia victoriae	Gastropoda		Pyramidellidae	Odostomia	
Notocypraea subcarnea	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Cowrie
Megastomia angasi	Gastropoda		Pyramidellidae	Megastomia	
Emmalena gawleri	Gastropoda	Stylommatophora	Rhytididae	Emmalena	Mount Lofty Carnivorous Snail
Hypermastus mucronatus	Gastropoda	Hypsogastropoda	Eulimidae	Hypermastus	Eulima
Zafra smithi	Gastropoda	Hypsogastropoda	Columbellidae	Zafra	Dove Shell
Lironoba layardi	Gastropoda	Hypsogastropoda	Rissoidae	Lironoba	
Mesoginella caducocincta	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	
Turrella granulosissima	Gastropoda	Hypsogastropoda	Clathurellidae	Turrella	Turrid Shell
Turrella gracilis	Gastropoda	Hypsogastropoda	Clathurellidae	Turrella	Turrid Shell
Maurea eltanini	Gastropoda		Calliostomatidae	Maurea	Top Shell
Pelycidion meizonarchei	Gastropoda	Hypsogastropoda	Pelycidiidae	Pelycidion	Gastropod
Ascorhis victoriae	Gastropoda	Hypsogastropoda	Tateidae	Ascorhis	Hydrobiid Snail
Sabia conica	Gastropoda	Hypsogastropoda	Hipponicidae	Hipponix	Horse Hoof Limpet
Gemixystus segmentatus	Gastropoda	Hypsogastropoda	Muricidae	Gemixystus	Murex Shell
Nassarius dijki	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Dog Whelk
Austromitra retrocurvata	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Inglisella etheridgei	Gastropoda	Hypsogastropoda	Cancellariidae	Inglisella	Nutmeg Shell
Mitromorpha axiscalpta	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Bathytoma hecatorguia	Gastropoda	Hypsogastropoda	Borsoniidae	Bathytoma	Turrid Shell
Clio recurva	Gastropoda	Pteropoda	Cavoliniidae	Clio	Shelled Pteropod
Marionia platyctenea	Gastropoda	Nudibranchia	Tritoniidae	Marioniopsis	Nudibranch
Geminoropa scindocataracta	Gastropoda	Stylommatophora	Charopidae	Geminoropa	Land Snail
Pernagera gatliffi	Gastropoda	Stylommatophora	Charopidae	Pernagera	Land Snail
Rissopsetia maoria	Gastropoda		Pyramidellidae	Rissopsetia	Gastropod
Trivirostra oryza	Gastropoda	Hypsogastropoda	Triviidae	Trivirostra	Bean Cowrie
Naricava angulata	Gastropoda	Hypsogastropoda	Vanikoridae	Naricava	Gastropod
Oreomava otwayensis	Gastropoda	Stylommatophora	Charopidae	Oreomava	
Austropyrgus conicus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Odostomia occultidens	Gastropoda		Pyramidellidae	Odostomia	Gastropod

Daphnella (Daphnella) stiphra	Gastropoda	Hypsogastropoda	Raphitomidae	Daphnella	Turrid Shell
Bembicium vittatum	Gastropoda	Hypsogastropoda	Littorinidae	Bembicium	Periwinkle
Sinezona pacifica	Gastropoda		Scissurellidae	Sinezona	Slit Shell
Excellaoma reteporoides	Gastropoda	Stylommatophora	Charopidae	Excellaoma	Lofty Ranges Pinwheel Snail
Austropyrgus fonscultus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Mesoginella sinapi	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	Marginella
Tylospira scutulata	Gastropoda	Hypsogastropoda	Struthiolariidae	Tylospira	Pelican-foot Shell
Anatoma australis	Gastropoda		Anatomidae	Anatoma	Slit Shell
Enixotrophon araios	Gastropoda	Hypsogastropoda	Muricidae	Enixotrophon	Murex Shell
Cominella (Josepha) tasmanica	Gastropoda	Hypsogastropoda	Buccinidae	Cominella	Whelk
Retusa amphizosta	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Paradrillia metcalfei	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	
Notoacmea conoidea	Gastropoda		Lottiidae	Notoacmea	Limpet
Guraleus fallaciosus	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Zeadmete kulanda	Gastropoda	Hypsogastropoda	Cancellariidae	Zeadmete	
Pisinna salebrosa	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Sagenotriphora ampulla	Gastropoda	Hypsogastropoda	Triphoridae	Sagenotriphora	Creeper
Gyrineum gyrinum	Gastropoda	Hypsogastropoda	Cymatiidae	Gyrineum	Tadpole Triton Or Ranella
Mitrella bicincta	Gastropoda	Hypsogastropoda	Columbellidae	Mitrella	Dove Shell
Zafra columnaria	Gastropoda	Hypsogastropoda	Columbellidae	Zafra	Dove Shell
Odostomia metcalfei	Gastropoda		Pyramidellidae	Odostomia	
Badepigrus protractus	Gastropoda	Hypsogastropoda	Anabathridae	Badepigrus	Gastropod
Brookesena columnaria	Gastropoda		Mathildidae	Brookesena	
Conus (Floraconus) papilliferus	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Austropyrgus zeidleri	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Etrema (Etremopa) nassoides	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Pisinna frenchiensis	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Taranis mayi	Gastropoda	Hypsogastropoda	Raphitomidae	Taranis	Turrid Shell
Mitromorpha bassiana	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Pleurotomella brenchleyi	Gastropoda	Hypsogastropoda	Raphitomidae	Pleurotomella	Turrid Shell
Oliva australis	Gastropoda	Hypsogastropoda	Olividae	Oliva	Olive Shell
Hypermastus coxi	Gastropoda	Hypsogastropoda	Eulimidae	Hypermastus	Eulima
Polinices mammilla	Gastropoda	Hypsogastropoda	Naticidae	Polinices	Sand Snail
Eatoniella (Albosabula) pellucida	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Conus (Splinoconus) boeticus	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Microcarina mayii	Gastropoda			Microcarina	
Agatha manifesta	Gastropoda		Pyramidellidae	Agatha	
Deroceras panormitanum	Gastropoda	Stylommatophora	Agriolimacidae	Deroceras	Brown Field Slug
Oxychilus draparnaudi	Gastropoda	Stylommatophora	Zonitidae	Oxychilus	Draparnaud's Glass-snail
Jorunna pantherina	Gastropoda	Nudibranchia	Discodorididae	Jorunna	Dorid Nudibranch
Microsveltia patricia	Gastropoda	Hypsogastropoda	Cancellariidae	Microsveltia	Nutmeg Shell
Janthina pallida	Gastropoda	Hypsogastropoda	Epitoniidae	Janthina	Violet Snail
Trivellona excelsa	Gastropoda	Hypsogastropoda	Triviidae	Trivellona	Bean Cowrie
Syrnola tasmanica	Gastropoda		Pyramidellidae	Syrnola	
Scrinium brazieri	Gastropoda	Hypsogastropoda	Mitromorphidae	Scrinium	Turrid Shell
Teinostoma (Callomphala) lucida	Gastropoda	Hypsogastropoda	Tornidae	Teinostoma	Bright Liotia
Bayardella cosmeta	Gastropoda		Planorbidae	Bayardella	Freshwater Snail
Eutriphora pseudocana	Gastropoda	Hypsogastropoda	Triphoridae	Eutriphora	Creeper
Smeagol parvulus	Gastropoda	Ellobiida	Otinidae	Smeagol	Air-breathing Slug
Filodrillia dulcis	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell

Tubercliopsis quinquepilia	Gastropoda	Hypsogastropoda	Cerithiopsidae	Tubercliopsis	Creeper
Phenacolepas calva	Gastropoda	Neritopsina	Phenacolepadidae	Phenacolepas	Sugar Limpet
Phasianella solida	Gastropoda		Turbinidae	Phasianella	Pheasant Shell
Inella innotabilis	Gastropoda	Hypsogastropoda	Triphoridae	Inella	
Nanoropa scindocataracta	Gastropoda	Stylommatophora	Charopidae	Nanoropa	Splitters Falls Pinwheel Snail
Diaphana brazieri	Gastropoda	Cephalaspidea	Diaphanidae	Diaphana	Bubble Shell
Epitonium coreta	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Paramontana fusca	Gastropoda	Hypsogastropoda	Raphitomidae	Paramontana	Turrid Shell
Cantharidella balteata	Gastropoda		Trochidae	Cantharidella	Top Shell
Gergovia exigua	Gastropoda	Hypsogastropoda	Cancellariidae	Gergovia	
Rostanga bassia	Gastropoda	Nudibranchia	Discodorididae	Rostanga	Nudibranch
Smeagol phillipensis	Gastropoda	Ellobiida	Otinidae	Smeagol	Air-breathing Slug
Peculator porphyria	Gastropoda	Hypsogastropoda	Volutomitridae	Peculator	Volutomitrid
Hydatina physis	Gastropoda		Aplustridae	Hydatina	Bubble Shell
Pseudodaphnella tincta	Gastropoda	Hypsogastropoda	Raphitomidae	Pseudodaphnella	
Austrochloritis abrotonus	Gastropoda	Stylommatophora	Camaenidae	Austrochloritis	Bermagui Bristle Snail
Cheilea flindersi	Gastropoda	Hypsogastropoda	Hipponicidae	Cheilea	Slipper Limpet
Tasmathera legrandi	Gastropoda	Stylommatophora	Charopidae	Tasmathera	Legrandâ€™s Pinwheel Snail
Oxynoe jacksoni	Gastropoda		Oxynoidae	Oxynoe	Sea Slug
Calliostoma (Fautor) columnarium	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Guraleus fossa	Gastropoda	Hypsogastropoda	Mangeliidae	Guraleus	Turrid Shell
Anachis beachportensis	Gastropoda	Hypsogastropoda	Columbellidae	Anachis	Dove Shell
Rissopsetia maccoyi	Gastropoda		Pyramidellidae	Rissopsetia	
Nototriphora vestita	Gastropoda	Hypsogastropoda	Triphoridae	Nototriphora	Creeper
Ringicula dolaris	Gastropoda	Ringiculida	Ringiculidae	Ringicula	Bubble Shell
Filodrillia trophonoides	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Hebeulima crassiceps	Gastropoda	Hypsogastropoda	Eulimidae	Hebeulima	Eulima
Aegires punctilucens	Gastropoda	Nudibranchia	Aegiridae	Aegires	Nudibranch
Rissoina (Rissoina) cretacea	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Conus (Floraconus) compressus	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Austrochloritis brevipila	Gastropoda	Stylommatophora	Camaenidae	Austrochloritis	Dorrigo Bristle Snail
Crassispira (Crassispira) harpularia	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Crassispira	Turrid Shell
Scrinium furtivum	Gastropoda	Hypsogastropoda	Mitromorphidae	Scrinium	Turrid Shell
Benthofascis sarcinula	Gastropoda	Hypsogastropoda	Conorbidae	Benthofascis	Gastropod
Engina australis	Gastropoda	Hypsogastropoda	Buccinidae	Engina	Whelk
Austropyrgus aslini	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Helicorbis australiensis	Gastropoda		Planorbidae	Helicorbis	Freshwater Snail
Semicassis (Semicassis) sophia	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Helmet Shell
Tetraphora granifera	Gastropoda	Hypsogastropoda	Triphoridae	Tetraphora	
Austrodrillia subplicata	Gastropoda	Hypsogastropoda	Horaiclavidae	Austrodrillia	Turrid Shell
Paradrillia coriorudis	Gastropoda	Hypsogastropoda	Horaiclavidae	Paradrillia	
Murdochella macrina	Gastropoda	Hypsogastropoda	Epitoniidae	Murdochella	Wentletrap
Gabrielona pisinna	Gastropoda		Turbinidae	Gabrielona	Gastropod
Clanculus albanyensis	Gastropoda		Trochidae	Clanculus	Top Shell
Zoila venusta	Gastropoda	Hypsogastropoda	Cypraeidae	Zoila	Cowrie
Quasimitra solida	Gastropoda	Hypsogastropoda	Mitridae	Quasimitra	Solid Mitre
Gazameda iredalei	Gastropoda	Cerithimorpha	Turritellidae	Gazameda	Screw Shell
Acteon retusus	Gastropoda		Acteonidae	Acteon	Bubble Shell
Cystiscus alternans	Gastropoda	Hypsogastropoda	Cystiscidae	Cystiscus	Marginella
Clanculus undatoides	Gastropoda		Trochidae	Clanculus	Top Shell

Austropyrgus nanoacuminatus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Rissoella (Jeffreysilla) confusa	Gastropoda		Rissoellidae	Rissoella	
Semicassis (Semicassis) angasi	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Angas' Bonnet
Austropyrgus ora	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Nanula galbina	Gastropoda		Trochidae	Nanula	Yellow Top Shell
Eulima lodderae	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	Eulima
Limacina retroversa	Gastropoda	Pteropoda	Limacinidae	Limacina	Shelled Pteropod
Aphelodoris greeni	Gastropoda	Nudibranchia	Dorididae	Aphelodoris	Nudibranch
Retusa chrysoma	Gastropoda	Cephalaspidea	Retusidae	Retusa	Bubble Shell
Xerocincta neglecta	Gastropoda	Stylommatophora	Hygromiidae	Xerocincta	Dune Snail
Glaucus atlanticus	Gastropoda	Nudibranchia	Glaucidae	Glaucus	Pelagic Nudibranch
Microsveltia haswelli	Gastropoda	Hypsogastropoda	Cancellariidae	Microsveltia	Nutmeg Shell
Bedeva flindersi	Gastropoda	Hypsogastropoda	Muricidae	Bedeva	Whelk
Cingulina pulchra	Gastropoda		Pyramidellidae	Cingulina	
Liotella vercoi	Gastropoda			Liotella	Gastropod
Alexania globula	Gastropoda	Hypsogastropoda	Epitoniidae	Alexania	Wentletrap
Austropyrgus exiguus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Favorinus pannuceus	Gastropoda	Nudibranchia	Facelinidae	Favorinus	Nudibranch
Charisma arenacea	Gastropoda		Trochidae	Charisma	Sandy Charisma
Gemixystus rhodanos	Gastropoda	Hypsogastropoda	Muricidae	Gemixystus	Murex Shell
Vitellidelos helmsiana	Gastropoda	Stylommatophora	Rhytididae	Vitellidelos	Snowy Mountains Carnivorous Snail
Melibe cf. australis	Gastropoda	Nudibranchia	Tethydidae	Melibe	
Glacidorbis hedleyi	Gastropoda		Glacidorbidae	Glacidorbis	Freshwater Snail
Melanella schoutanica	Gastropoda	Hypsogastropoda	Eulimidae	Melanella	
Asperdaphne (Asperdaphne) esperanza	Gastropoda	Hypsogastropoda	Raphitomidae	Asperdaphne	Turrid Shell
Ascorhis occidua	Gastropoda	Hypsogastropoda	Tateidae	Ascorhis	Hydrobiid Snail
Columbarium spinicinctum	Gastropoda	Hypsogastropoda	Turbinellidae	Columbarium	Pagoda Shell
Macroschisma bakiei	Gastropoda		Fissurellidae	Macroschisma	Baker's Slot Limpet
Austroharpa (Palamharpa) punctata	Gastropoda	Hypsogastropoda	Harpidae	Austroharpa	Spotted Harp
Austrochloritis beecheyi	Gastropoda	Stylommatophora	Camaenidae	Austrochloritis	Wilsons Promontory Bristle Snail
Pleurotomella bullata	Gastropoda	Hypsogastropoda	Raphitomidae	Pleurotomella	
Maoritomella dilecta	Gastropoda	Hypsogastropoda	Borsoniidae	Maoritomella	Beloved Turrid
Mesoginella punicea	Gastropoda	Hypsogastropoda	Marginellidae	Mesoginella	
Amalda monilifera	Gastropoda	Hypsogastropoda	Olividae	Amalda	Ancilla
Notoacmea subantarctica	Gastropoda		Lottiidae	Notoacmea	Limpet
Maurea osbornei	Gastropoda		Calliostomatidae	Maurea	Top Shell
Pisinna labrotoma	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Onoba hebes	Gastropoda	Hypsogastropoda	Rissoidae	Lironoba	Rissoid
Haurakia imitator	Gastropoda	Hypsogastropoda	Rissoidae	Pusillina	Rissoid
Notocypraea dissecta	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Cowrie
Austrotriton mimetica	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Austrotriton petulans	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Austrosassia ponderi	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Pterotrachea kingicola	Gastropoda	Hypsogastropoda	Pterotracheidae	Pterotrachea	Pelagic Gastropod
Trituba epallaxa	Gastropoda	Hypsogastropoda	Newtoniellidae	Trituba	Creeper
Eulima broadbentae	Gastropoda	Hypsogastropoda	Eulimidae	Eulima	Eulima
Apicalia tryoni	Gastropoda	Hypsogastropoda	Eulimidae	Apicalia	Eulima
Sabinella schoutanica	Gastropoda	Hypsogastropoda	Eulimidae	Sabinella	Eulima
Swainsonia ocellata	Gastropoda	Hypsogastropoda	Mitridae	Scabricola	Mitre Shell
Austromitra schomburgki	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell

Austromitra vincta	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Turrella letourneuxiana	Gastropoda	Hypsogastropoda	Clathurellidae	Turrella	Turrid
Turbonilla propingua	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Odostomia crassicosta	Gastropoda		Pyramidellidae	Linopyrga	Gastropod
Koloonella coacta	Gastropoda		Murchisonellidae	Koloonella	Gastropod
Verconia aureopunctata	Gastropoda	Nudibranchia	Chromodorididae	Verconia	Nudibranch
Samla rubropurpurata	Gastropoda	Nudibranchia	Flabellinidae	Coryphellina	Nudibranch
Anteaeolidiella cacaotica	Gastropoda	Nudibranchia	Aeolidiidae	Anteaeolidiella	Nudibranch
Eatoniella roseola	Gastropoda	Hypsogastropoda	Eatoniellidae	Eatoniella	Gastropod
Iphitus neozelanicus	Gastropoda	Hypsogastropoda	Epitoniidae	Iphitus	Wentletrap
Proterato lachryma	Gastropoda	Hypsogastropoda	Triviidae	Proterato	Bean Cowrie
Pisinna subfusca	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	
Paralaoma servilis	Gastropoda	Stylommatophora	Punctidae	Paralaoma	
Myosotella myosotis	Gastropoda	Ellobiida	Ellobiidae	Myosotella	Air-breathing Snail
Diloma aethiops	Gastropoda		Trochidae	Diloma	Periwinkle
Pedicularia pacifica	Gastropoda	Hypsogastropoda	Ovulidae	Pedicularia	Allied Cowrie
Cuvierina columnella	Gastropoda	Pteropoda	Cavoliniidae	Cuvierina	Shelled Pteropod
Buccinulum linea	Gastropoda	Hypsogastropoda	Buccinidae	Buccinulum	Whelk
Phrixgnathus hamiltoni	Gastropoda	Stylommatophora	Punctidae	Phrixgnathus	
Janolus eximius	Gastropoda	Nudibranchia	Proctonotidae	Janolus	
Cumia reticulata	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	
Oreomava johnstoni	Gastropoda	Stylommatophora	Charopidae	Oreomava	
Euplica bidentata	Gastropoda	Hypsogastropoda	Columbellidae	Euplica	Dove Shell
Capulus danieli	Gastropoda	Hypsogastropoda	Capulidae	Capulus	Cap Limpet
Bonellitia scobina	Gastropoda	Hypsogastropoda	Cancellariidae	Bonellitia	Nutmeg Shell
Elachorbis tatei	Gastropoda	Hypsogastropoda	Tornidae	Elachorbis	Gastropod
Badepigrus semicinctus	Gastropoda	Hypsogastropoda	Anabathridae	Badepigrus	Gastropod
Pyrgulina pascoei	Gastropoda		Pyramidellidae	Pyrgulina	
Calliostoma (Fautor) zietzi	Gastropoda		Calliostomatidae	Calliostoma	Top Shell
Aplysia extraordinaria	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Austropyrgus gunnii	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobiid Snail
Tubercliopsis exigua	Gastropoda	Hypsogastropoda	Cerithiopsidae	Tubercliopsis	Creeper
Botelloides sulcatus	Gastropoda		Trochidae	Botelloides	Top Shell
Vercomaris pergradata	Gastropoda	Hypsogastropoda	Cancellariidae	Vercomaris	
Microdryas iravadioides	Gastropoda	Hypsogastropoda	Anabathridae	Microdryas	Gastropod
Nassarius (Plicarcularia) pullus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Ribbed Dog Whelk
Eudolium bairdii	Gastropoda	Hypsogastropoda	Tonnidae	Eudolium	Tun Shell
Aplysia gigantea	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Aplysia oculifera	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Socienna hebes	Gastropoda	Hypsogastropoda	Cerithiopsidae	Socienna	Creeper
Marinula parva	Gastropoda	Ellobiida	Ellobiidae	Marinula	Air-breathing Snail
Lymnaea stagnalis	Gastropoda		Lymnaeidae	Lymnaea	Freshwater Snail
Styliola subula	Gastropoda	Pteropoda	Cavoliniidae	Styliola	Shelled Pteropod
Nerita (Ritena) plicata	Gastropoda	Neritopsina	Neritidae	Nerita	Plicate Nerite
Ittibittium houbricki	Gastropoda	Cerithimorpha	Cerithiidae	Ittibittium	Creeper
Inquisitor hedleyi	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Inquisitor	Turrid Shell
Belomitra challengeri	Gastropoda	Hypsogastropoda	Borsoniidae	Belomitra	Whelk
Austropyrgus tateiformis	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Selastele retiarium	Gastropoda		Calliostomatidae	Selastele	Netted Top Shell
Parastrophia (Parastrophia) erseusi	Gastropoda	Hypsogastropoda	Caecidae	Parastrophia	Gastropod

Favartia (Murexiella) phantom	Gastropoda	Hypsogastropoda	Muricidae	Favartia	Murex Shell
Australaria bakeri	Gastropoda	Hypsogastropoda	Fasciolariidae	Australaria	Spindle Shell
Nassarius (Zeuxis) dorsatus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	One Colour Dog Whelk
Calliotropis canaliculata	Gastropoda		Calliotropidae	Calliotropis	Gastropod
Lottia onychitis	Gastropoda		Lottiidae	Lottia	Limpet
Haliotis brazieri	Gastropoda		Haliotidae	Haliotis	Abalone
Australaria coronata	Gastropoda	Hypsogastropoda	Fasciolariidae	Australaria	Spindle Shell
Cavolinia uncinata	Gastropoda	Pteropoda	Cavoliniidae	Cavolinia	Shelled Pteropod
Naccula punctata	Gastropoda		Nacellidae	Naccula	Limpet
Odontotrochus chlorostomus	Gastropoda		Trochidae	Odontotrochus	Freycinet's Top Shell
Leuconopsis inermis	Gastropoda	Ellobiida	Ellobiidae	Leuconopsis	Air-breathing Snail
Austropyrgus solitarius	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Polycera capensis	Gastropoda	Nudibranchia	Polyceridae	Polycera	Nudibranch
Trinchesia sororum	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	Nudibranch
Chromodoris thompsoni	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	Nudibranch
Cadlina nigrobranchiata	Gastropoda	Nudibranchia	Chromodorididae	Cadlina	Nudibranch
Epideira schoutanica	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Filodrillia haswelli	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Hebeulima inusta	Gastropoda	Hypsogastropoda	Eulimidae	Hebeulima	
Notocypraea pulicaria	Gastropoda	Hypsogastropoda	Cypraeidae	Notocypraea	Flea-spotted Cowry
Graphicomassa peroniana	Gastropoda	Hypsogastropoda	Columbellidae	Graphicomassa	
Laevilitorina (Macquariella) hamiltoni	Gastropoda	Hypsogastropoda	Littorinidae	Laevilitorina	
Prolesophanta occlusa	Gastropoda	Stylommatophora	Rhytididae	Prolesophanta	Miniscule Carnivorous Snail
Etrema (Etrema) kitcheni	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Anachis fenestrata	Gastropoda	Hypsogastropoda	Columbellidae	Anachis	Dove Shell
Echinolittorina (Granulittorina) reticulata	Gastropoda	Hypsogastropoda	Littorinidae	Echinolittorina	
Gabbia iredalei	Gastropoda	Hypsogastropoda	Bithyniidae	Gabbia	Gastropod
Calliostoma (Fautor) excultum	Gastropoda		Calliostomatidae	Calliostoma	
Pupisoma porti	Gastropoda	Stylommatophora	Pupillidae	Pupisoma	Tall Toothless Pupasnail
Notovoluta verconis	Gastropoda	Hypsogastropoda	Volutidae	Notovoluta	Volute
Epitonium (Lamelliscala) godfreyi	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Eatonina (Coriandria) fulvicolumella	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Rissoina (Rissoina) jaffa	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Coralliophila mira	Gastropoda	Hypsogastropoda	Muricidae	Coralliophila	Coral Shell
Asteracmea roseoradiata	Gastropoda		Lottiidae	Asteracmea	Limpet
Opalia ballinensis	Gastropoda	Hypsogastropoda	Epitoniidae	Opalia	Wentletrap
Zyghelix forsteriana	Gastropoda	Stylommatophora	Camaenidae	Zyghelix	
Erronea errones	Gastropoda	Hypsogastropoda	Cypraeidae	Erronea	Cowrie
Eatonina (Eatonina) rubrilabiata	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Granulifusus kiranus	Gastropoda	Hypsogastropoda	Fasciolariidae	Granulifusus	Spindle Shell
Scrupus minutus	Gastropoda	Hypsogastropoda	Tornidae	Scrupus	
Cystopelta astra	Gastropoda	Stylommatophora	Cystopeltidae	Cystopelta	Snowy Mountains Humpback Snail
Austropyrgus smithii	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobiid Snail
Exomilus pentagonalis	Gastropoda	Hypsogastropoda	Raphitomidae	Exomilus	Turrid Shell
Pseudosuccinea columella	Gastropoda		Lymnaeidae	Pseudosuccinea	Freshwater Snail
Magnosinister hedleyi	Gastropoda	Hypsogastropoda	Triphoridae	Magnosinister	Creeper
Ringicula meridionalis	Gastropoda	Ringiculida	Ringiculidae	Ringicula	
Insularopa barrenensis	Gastropoda	Stylommatophora	Charopidae	Insularopa	Furneaux Islands Pinwheel Snail
Aplysia argus	Gastropoda	Aplysiida	Aplysiidae	Aplysia	Sea Hare
Splendrillia gratiosa	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell

Dendrodoris aurea	Gastropoda	Nudibranchia	Dendrodorididae	Dendrodoris	
Notogibbula bicarinata	Gastropoda		Trochidae	Notogibbula	Cox's Top Shell
Nitor circumcinctus	Gastropoda	Stylommatophora	Helicarionidae	Nitor	Illawarra Glass-snail
Turrella subcostata	Gastropoda	Hypsogastropoda	Clathurellidae	Turrella	Turrid Shell
Marita nitidus	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Pommerhelix mastersi	Gastropoda	Stylommatophora	Camaenidae	Pommerhelix	Merimbula Woodland Snail
Turbonilla vana	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Socienna apicicostata	Gastropoda	Hypsogastropoda	Cerithiopsidae	Socienna	Creeper
Tonna variegata	Gastropoda	Hypsogastropoda	Tonnidae	Tonna	Beer Barrel
Thalassocyon bonus	Gastropoda	Hypsogastropoda	Thalassocyonidae	Thalassocyon	Gastropod
Granosolarium asperum	Gastropoda		Architectonicidae	Granosolarium	Staircase Shell
Tanea euzona	Gastropoda	Hypsogastropoda	Naticidae	Tanea	Painted Sand Snail
Coralliophila nodosa	Gastropoda	Hypsogastropoda	Muricidae	Coralliophila	Coral Shell
Corolla ovata	Gastropoda	Pteropoda	Cymbuliidae	Corolla	Shelled Pteropod
Chromodoris splendida	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	
Agatha laevis	Gastropoda		Pyramidellidae	Agatha	Gastropod
Socienna crassa	Gastropoda	Hypsogastropoda	Cerithiopsidae	Socienna	Creeper
Cocculinella coercita	Gastropoda		Cocculinellidae	Cocculinella	Limpet
Canarium mutabile	Gastropoda	Hypsogastropoda	Strombidae	Canarium	Stromb
Vexillum (Costellaria) discolorium	Gastropoda	Hypsogastropoda	Costellariidae	Vexillum	Costellate Mitre Shell
Austropyrgus pusillus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobid Snail
Ancylastrum cumingianus	Gastropoda		Planorbidae	Ancylastrum	Freshwater Snail
Joculator gracilis	Gastropoda	Hypsogastropoda	Cerithiopsidae	Joculator	Creeper
Propebela permutatus	Gastropoda	Hypsogastropoda	Mangeliidae	Propebela	
Rostanga arbutus	Gastropoda	Nudibranchia	Discodorididae	Rostanga	
Herpetopoma fenestrata	Gastropoda		Chilodontidae	Herpetopoma	Gastropod
Hinemoa montuosa	Gastropoda		Pyramidellidae	Hinemoa	
Scaphander illecebrosus	Gastropoda	Cephalaspidea	Cylichnidae	Scaphander	Bubble Shell
Chrysallida lucida	Gastropoda		Pyramidellidae	Chrysallida	Gastropod
Circulus delectabile	Gastropoda	Hypsogastropoda	Vitrinellidae	Circulus	
Mitromorpha paula	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Coxiella (Coxiella) molesta	Gastropoda	Hypsogastropoda	Tomichiidae	Coxiella	Salt Lake Snail
Planilaoma luckmanii	Gastropoda	Stylommatophora	Charopidae	Planilaoma	
Haliotis roei	Gastropoda		Haliotidae	Haliotis	Roe's Abalone
Specula mammilla	Gastropoda	Hypsogastropoda	Cerithiopsidae	Specula	Creeper
Pseudostomatella decolorata	Gastropoda		Trochidae	Pseudostomatella	Ear Shell
Koloonella micra	Gastropoda		Murchisonellidae	Koloonella	Gastropod
Trinchesia anulata	Gastropoda	Nudibranchia	Trinchesiidae	Trinchesia	Nudibranch
Cerithium dialeucum	Gastropoda	Cerithimorpha	Cerithiidae	Cerithium	Creeper
Coralliophila tetragona	Gastropoda	Hypsogastropoda	Muricidae	Coralliophila	
Semicassis (Semicassis) royana	Gastropoda	Hypsogastropoda	Cassidae	Semicassis	Hedley's Helmet
Seguenzia polita	Gastropoda		Seguenziidae	Seguenzia	
Cryptassiminea surryensis	Gastropoda	Hypsogastropoda	Assimineidae	Cryptassiminea	Gastropod
Bathytoma (Micantapex) profundis	Gastropoda	Hypsogastropoda	Borsoniidae	Bathytoma	Turrid Shell
Pisinna paucirugosa	Gastropoda	Hypsogastropoda	Anabathridae	Pisinna	Gastropod
Obesula profundior	Gastropoda	Hypsogastropoda	Triphoridae	Obesula	Creeper
Epitonium (Hyaloscala) philippinarum	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Gyraulus (Pygmanisus) scottianus	Gastropoda		Planorbidae	Gyraulus	Freshwater Snail
Glacidorbis otwayensis	Gastropoda		Glacidorbidae	Glacidorbis	Freshwater Snail
Iotula microcosmos	Gastropoda	Stylommatophora	Punctidae	Iotula	Minuscule Pinhead Snail

Microvoluta stadialis	Gastropoda	Hypsogastropoda	Volutomitridae	Microvoluta	Volutomitrid
Palmadusta asellus	Gastropoda	Hypsogastropoda	Cypraeidae	Palmadusta	Little-donkey Cowry
Beddomeia kessneri	Gastropoda	Hypsogastropoda	Tateidae	Beddomeia	Hydrobiid Snail
Splendrillia acostata	Gastropoda	Hypsogastropoda	Drilliidae	Splendrillia	Turrid Shell
Persicula pulchella	Gastropoda	Hypsogastropoda	Cystiscidae	Persicula	Flat-topped Margin Shell
Clanculus ringens	Gastropoda		Trochidae	Clanculus	The Ringent Clanculus
Africotriton carinapex	Gastropoda	Hypsogastropoda	Cancellariidae	Africotriton	Nutmeg Shell
Notocrater ponderi	Gastropoda		Pseudococculinidae	Notocrater	Limpet
Eudaronia jaffaensis	Gastropoda			Eudaronia	Gastropod
Inella obtusa	Gastropoda	Hypsogastropoda	Triphoridae	Inella	Creeper
Cypraeerato angistoma	Gastropoda	Hypsogastropoda	Eratoidae	Cypraeerato	
Rissoina (Rissoina) crassa	Gastropoda	Hypsogastropoda	Rissoinidae	Rissoina	Rissoid
Turbonilla gravis	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Metaropa pulleinei	Gastropoda	Stylommatophora	Charopidae	Metaropa	Pulleineâ€™s Pinwheel Snail
Chromodoris lineolata	Gastropoda	Nudibranchia	Chromodorididae	Chromodoris	Nudibranch
Nanocochlea parva	Gastropoda	Hypsogastropoda	Tateidae	Nanocochlea	Hydrobiid Snail
Phytia myosotis	Gastropoda	Ellobiida	Ellobiidae	Phytia	
Nepotilla microscopica	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Vitrinella cancellata	Gastropoda	Hypsogastropoda	Vitrinellidae	Vitrinella	
Cheilea occidua	Gastropoda	Hypsogastropoda	Hipponicidae	Cheilea	Slipper Limpet
Clanculus maugeri	Gastropoda		Trochidae	Clanculus	Mauger's Clanuculus Shell
Nepotilla aculeata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Rissoella (Jeffreysiella) secunda	Gastropoda		Rissoellidae	Rissoella	Gastropod
Rostanga bifurcata	Gastropoda	Nudibranchia	Discodorididae	Rostanga	Nudibranch
Prolesophanta nelsonensis	Gastropoda	Stylommatophora	Rhytididae	Prolesophanta	Mount Nelson Carnivorous Snail
Leiopyrga octona	Gastropoda		Trochidae	Leiopyrga	Top Shell
Gyroscala lamellosa	Gastropoda	Hypsogastropoda	Epitoniidae	Gyroscala	Perplexing Ladder Shell
Eulitoma nitens	Gastropoda	Hypsogastropoda	Eulimidae	Eulitoma	Eulima
Austroliotia scalaris	Gastropoda		Turbinidae	Austroliotia	Liotine
Stephopoma nucleogranosum	Gastropoda	Cerithimorpha	Siliquariidae	Stephopoma	Sponge Worm Shell
Turritellopsis kimberi	Gastropoda	Cerithimorpha	Turritellidae	Turritellopsis	Gastropod
Volvarina diminuta	Gastropoda	Hypsogastropoda	Marginellidae	Volvarina	Marginella
Conus (Virroconus) coronatus	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Haliotis varia	Gastropoda		Haliotidae	Haliotis	Variable Abalone
Enixotrophon latus	Gastropoda	Hypsogastropoda	Muricidae	Enixotrophon	Murex Shell
Cassidula (Cassidula) zonata	Gastropoda	Ellobiida	Ellobiidae	Cassidula	Air-breathing Snail
Fiona pinnata	Gastropoda	Nudibranchia	Fionidae	Fiona	Nudibranch
Mancinella alouina	Gastropoda	Hypsogastropoda	Muricidae	Mancinella	Whelk
Marita schoutenensis	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Nannamoria amicula	Gastropoda	Hypsogastropoda	Volutidae	Nannamoria	Volute
Synthopsis exilis	Gastropoda	Hypsogastropoda	Cerithiopsidae	Synthopsis	Creeper
Marita tumida	Gastropoda	Hypsogastropoda	Mangeliidae	Marita	Turrid Shell
Alvania (Linemera) thouinensis	Gastropoda	Hypsogastropoda	Rissoidae	Alvania	Rissoid
Attenuata integella	Gastropoda	Hypsogastropoda	Rissoidae	Attenuata	Rissoid
Eatonina (Eatonina) hedleyi	Gastropoda	Hypsogastropoda	Cingulopsidae	Eatonina	Gastropod
Austropusilla (Austropusilla) profundis	Gastropoda	Hypsogastropoda	Raphitomidae	Austropusilla	Turrid Shell
Beddomeia mesibovi	Gastropoda	Hypsogastropoda	Tateidae	Beddomeia	Hydrobiid Snail (arthur River)
Capulus sycophanta	Gastropoda	Hypsogastropoda	Capulidae	Capulus	
Nepotilla serrata	Gastropoda	Hypsogastropoda	Raphitomidae	Nepotilla	Turrid Shell
Pelycidion xanthias	Gastropoda	Hypsogastropoda	Pelycidiidae	Pelycidion	Gastropod

Turbonilla ambulatia	Gastropoda		Pyramidellidae	Turbonilla	
Ranularia pyrum	Gastropoda	Hypsogastropoda	Cymatiidae	Ranularia	Pear Triton
Hydroginella dispersa	Gastropoda	Hypsogastropoda	Marginellidae	Hydroginella	Marginella
Incisura auriformis	Gastropoda		Scissurellidae	Incisura	Slit Shell
Heliacus (Torinista) ponderi	Gastropoda		Architectonicidae	Heliacus	Staircase Shell
Epitonium fabia	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	Wentletrap
Conus (Gastridium) geographus	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Trituba dexia	Gastropoda	Hypsogastropoda	Newtoniellidae	Trituba	
Antillophos (Antillophos) naucratoros	Gastropoda	Hypsogastropoda	Nassariidae	Antillophos	Whelk
Sassia remensa	Gastropoda	Hypsogastropoda	Cymatiidae	Sassia	Triton Shell
Turbo (Turbo) jourdani	Gastropoda		Turbinidae	Turbo	Turban Shell
Liotella kilcundae	Gastropoda			Liotella	Gastropod
Etrema (Etrema) sparula	Gastropoda	Hypsogastropoda	Clathurellidae	Etrema	Turrid Shell
Specula regina	Gastropoda	Hypsogastropoda	Cerithiopsidae	Specula	Creeper
Victaphanta lampra	Gastropoda	Stylommatophora	Rhytididae	Victaphanta	North Tasmanian Carnivorous Snail
Nassarius (Alectrion) spiratus	Gastropoda	Hypsogastropoda	Nassariidae	Nassarius	Spired Dog Whelk
Turbonilla tiara	Gastropoda		Pyramidellidae	Turbonilla	
Ringicula australis	Gastropoda	Ringiculida	Ringiculidae	Ringicula	Bubble Shell
Hebeulima columnaria	Gastropoda	Hypsogastropoda	Eulimidae	Hebeulima	Eulima
Austropyrgus simsonianus	Gastropoda	Hypsogastropoda	Tateidae	Austropyrgus	Hydrobiid Snail
Conus (Cylinder) legatus	Gastropoda	Hypsogastropoda	Conidae	Conus	The Ambassador Cone
Pleurotomella aculeola	Gastropoda	Hypsogastropoda	Raphitomidae	Pleurotomella	
Mitromorpha axicostata	Gastropoda	Hypsogastropoda	Mitromorphidae	Mitromorpha	Turrid Shell
Paraseila halligani	Gastropoda	Hypsogastropoda	Cerithiopsidae	Paraseila	Creeper
Beddomeia lodderae	Gastropoda	Hypsogastropoda	Tateidae	Beddomeia	Hydrobiid Snail
Fusceulima flava	Gastropoda	Hypsogastropoda	Eulimidae	Fusceulima	
Monilea callifera	Gastropoda		Trochidae	Monilea	Top Shell
Monetaria moneta	Gastropoda	Hypsogastropoda	Cypraeidae	Monetaria	Money Cowrie
Rissoella (Rissoella) vitrea	Gastropoda		Rissoellidae	Rissoella	Gastropod
Janolus hyalinus	Gastropoda	Nudibranchia	Proctonotidae	Janolus	Nudibranch
Bostrycapulus pritzkeri	Gastropoda	Hypsogastropoda	Calyptraeidae	Bostrycapulus	
Bischoffena bischoffensis	Gastropoda	Stylommatophora	Charopidae	Bischoffena	
Parastrophia (Parastrophia) cygnicollis	Gastropoda	Hypsogastropoda	Caecidae	Parastrophia	Gastropod
Cypraea tigris	Gastropoda	Hypsogastropoda	Cypraeidae	Cypraea	Tiger Cowrie
Victodrobia burni	Gastropoda	Hypsogastropoda	Tateidae	Victodrobia	Hydrobiid Snail
Vitrea crystallina	Gastropoda	Stylommatophora	Zonitidae	Vitrea	
Jorunna cf. pantherina	Gastropoda	Nudibranchia	Discodorididae	Jorunna	
Lucerapex casearia	Gastropoda	Hypsogastropoda	Turridae	Lucerapex	Turrid Shell
Phycothais botanica	Gastropoda	Hypsogastropoda	Muricidae	Phycothais	Whelk
Epitonium (Papyriscala) robillardi	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	
Parvioris subobtusa	Gastropoda	Hypsogastropoda	Eulimidae	Parvioris	Eulima
Alloiodoris marmorata	Gastropoda	Nudibranchia	Discodorididae	Alloiodoris	Nudibranch
Conus (Eremiconus) minnamurra	Gastropoda	Hypsogastropoda	Conidae	Conus	Cone Snail
Tiberia nitidula	Gastropoda		Pyramidellidae	Tiberia	Gastropod
Rugadentia buliminoides	Gastropoda		Pyramidellidae	Rugadentia	Gastropod
Colpospira (Colpospira) curialis	Gastropoda	Cerithimorpha	Turritellidae	Colpospira	Screw Shell
Hypselodoris saintvincentius	Gastropoda	Nudibranchia	Chromodorididae	Hypselodoris	
Cadlina tasmanica	Gastropoda	Nudibranchia	Chromodorididae	Cadlina	Nudibranch
Beddomeia acheronensis	Gastropoda	Hypsogastropoda	Tateidae	Beddomeia	
Pygmipanda atomata	Gastropoda	Stylommatophora	Caryodidae	Pygmipanda	Dwarf Panda-snail

Epideira tuberculata	Gastropoda	Hypsogastropoda	Pseudomelatomidae	Epideira	Turrid Shell
Austromitra arnoldi	Gastropoda	Hypsogastropoda	Costellariidae	Austromitra	Costellate Mitre Shell
Turbonilla hedleyi	Gastropoda		Pyramidellidae	Turbonilla	Gastropod
Amphithalamus (Notoscrobs) liratus	Gastropoda	Hypsogastropoda	Anabathridae	Amphithalamus	Gastropod
Koloonella harrissoni	Gastropoda		Murchisonellidae	Koloonella	Gastropod
Filodrillia ornata	Gastropoda	Hypsogastropoda	Borsoniidae	Filodrillia	Turrid Shell
Patelloida nigrosulcata	Gastropoda		Lottiidae	Patelloida	Limpet
Gyraulus (Gyraulus) gilberti	Gastropoda		Planorbidae	Gyraulus	Freshwater Snail
Miselaoma weldii	Gastropoda	Stylommatophora	Punctidae	Miselaoma	Weld's Pinhead Snail
Cumia adjuncta	Gastropoda	Hypsogastropoda	Colubrariidae	Cumia	Whelk
Zoila friendii	Gastropoda	Hypsogastropoda	Cypraeidae	Zoila	
Turbo (Lunatica) militaris	Gastropoda		Turbinidae	Turbo	Smooth Turban Shell
Austrocylichna exigua	Gastropoda	Cephalaspidea	Haminoeidae	Austrocylichna	
Teretriphora gemmegens	Gastropoda	Hypsogastropoda	Triphoridae	Teretriphora	Creeper
Inella obliqua	Gastropoda	Hypsogastropoda	Triphoridae	Inella	Creeper
Aphelodoris lawsae	Gastropoda	Nudibranchia	Dorididae	Aphelodoris	Nudibranch
Cerberilla incola	Gastropoda	Nudibranchia	Aeolidiidae	Cerberilla	Nudibranch
Calthalotia fragum	Gastropoda		Trochidae	Calthalotia	Comtesse's Top Shell
Volvarina ealesae	Gastropoda	Hypsogastropoda	Marginellidae	Volvarina	Marginella
Argalista roseopunctata	Gastropoda		Turbinidae	Argalista	Rose Dotted Argalista
Epitonium (Parviscala) coretum	Gastropoda	Hypsogastropoda	Epitoniidae	Epitonium	
Carinastele niceteria	Gastropoda		Calliostomatidae	Carinastele	Top Shell
Fluxinella trochiformis	Gastropoda		Seguenziidae	Fluxinella	Gastropod
Crossea cancellata	Gastropoda		Skeneidae	Crossea	Gastropod
Conuber putealis	Gastropoda	Hypsogastropoda	Naticidae	Conuber	
Psilaxis oxytropis	Gastropoda		Architectonicidae	Psilaxis	Staircase Shell
Austrorissopsis maccoyi	Gastropoda	Hypsogastropoda	Eulimidae	Austrorissopsis	Gastropod
Tonna chinensis	Gastropoda	Hypsogastropoda	Tonnidae	Tonna	Tun Shell
Rugadentia ignava	Gastropoda		Pyramidellidae	Rugadentia	Gastropod
Creseis virgula	Gastropoda	Pteropoda	Cavoliniidae	Creseis	Shelled Pteropod
Plastiscala magna	Gastropoda	Hypsogastropoda	Epitoniidae	Plastiscala	
Austroginella georgiana	Gastropoda	Hypsogastropoda	Marginellidae	Austroginella	Marginella
Cochlicopa lubrica	Gastropoda	Stylommatophora	Cochlicopidae	Cochlicopa	Glossy Pillar Snail
Xenophora (Xenophora) solarioides	Gastropoda	Hypsogastropoda	Enophoridae	Xenophora	
Cycloscala hyalina	Gastropoda	Hypsogastropoda	Epitoniidae	Cycloscala	Wentletrap
Vexillum (Costellaria) apicitinctum	Gastropoda	Hypsogastropoda	Costellariidae	Vexillum	
Fax (Scaeofax) molleri	Gastropoda	Hypsogastropoda	Buccinidae	Fax	Whelk
Plaxiphora (Plaxiphora) albida	Polyplacophora	Chitonida	Mopaliidae	Plaxiphora	Chiton
Ischnochiton (Ischnoradsia) australis	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Ischnochiton) elongatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Ischnochiton) variegatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Heterozona) cariosus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Subterenochiton gabrieli	Polyplacophora	Chitonida	Ischnochitonidae	Subterenochiton	Chiton
Ischnochiton (Ischnochiton) versicolor	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Ischnochiton) lineolatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Cryptoplax striata	Polyplacophora	Chitonida	Cryptoplacidae	Cryptoplax	Chiton
Ischnochiton (Autochiton) virgatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Autochiton) torri	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Sypharochiton pelliserpentis	Polyplacophora	Chitonida	Chitonidae	Sypharochiton	Chiton
Acanthochitona retrojecta	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton

Ischnochiton (Haploplax) smaragdinus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Acanthochitona granostriata	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Rhyssoplax tricostalis	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Callistochiton antiquus	Polyplacophora	Chitonida	Ischnochitonidae	Callistochiton	Chiton
Craspedoplax variabilis	Polyplacophora	Chitonida	Acanthochitonidae	Craspedoplax	Chiton
Acanthochitona bednalli	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Acanthochitona pilsbryi	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Stenochiton cymodocealis	Polyplacophora	Chitonida	Ischnochitonidae	Stenochiton	Chiton
Ischnochiton (Haploplax) lentiginosus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Callochiton crocinus	Polyplacophora	Chitonida	Ischnochitonidae	Callochiton	Chiton
Cryptoplax iredalei	Polyplacophora	Chitonida	Cryptoplacidae	Cryptoplax	Chiton
Lorica volvox	Polyplacophora	Chitonida	Schizochitonidae	Lorica	Chiton
Leptochiton (Leptochiton) matthewsianus	Polyplacophora	Lepidopleurida	Leptochitonidae	Leptochiton	Chiton
Ischnochiton (Haploplax) thomasi	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Rhyssoplax diaphora	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Acanthochitona kimberi	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Ischnochiton (Ischnochiton) carinulatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Acanthochitona sueurii	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Acanthochitona coxi	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Rhyssoplax calliozona	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Bassethullia glypta	Polyplacophora	Chitonida	Acanthochitonidae	Bassethullia	Chiton 5254
Ischnochiton (Ischnochiton) falcatus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Rhyssoplax jugosa	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Ischnochiton (Heterozona) subviridis	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Bassethullia matthewsi	Polyplacophora	Chitonida	Acanthochitonidae	Bassethullia	Chiton
Ischnochiton (Ischnochiton) purus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Chiton (Amaurochiton) glaucus	Polyplacophora	Chitonida	Chitonidae	Chiton	Chiton
Notoplax costata	Polyplacophora	Chitonida	Acanthochitonidae	Notoplax	Chiton
Notoplax speciosa	Polyplacophora	Chitonida	Acanthochitonidae	Notoplax	Chiton
Loricella angasi	Polyplacophora	Chitonida	Schizochitonidae	Loricella	Chiton
Acanthochitona gatliffi	Polyplacophora	Chitonida	Acanthochitonidae	Acanthochitona	Chiton
Eudoxochiton (Eudoxoplax) inornatus	Polyplacophora	Chitonida	Ischnochitonidae	Eudoxochiton	Chiton
Notoplax addenda	Polyplacophora	Chitonida	Acanthochitonidae	Notoplax	Chiton
Leptoplax wilsoni	Polyplacophora	Chitonida	Acanthochitonidae	Leptoplax	Chiton
Notoplax rubrostrata	Polyplacophora	Chitonida	Acanthochitonidae	Notoplax	Chiton
Loricella profundior	Polyplacophora	Chitonida	Schizochitonidae	Loricella	Chiton
Plaxiphora (Fremblya) matthewsi	Polyplacophora	Chitonida	Mopaliidae	Plaxiphora	Chiton
Rhyssoplax orukta	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Stenochiton pilsbryanus	Polyplacophora	Chitonida	Ischnochitonidae	Stenochiton	Chiton
Rhyssoplax exoptanda	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Ischnochiton (Heterozona) fruticosus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	
Ischnochiton (Ischnochiton) wilsoni	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Ischnochiton) mayi	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Notoplax mayi	Polyplacophora	Chitonida	Acanthochitonidae	Notoplax	Chiton
Onithochiton quercinus	Polyplacophora	Chitonida	Chitonidae	Onithochiton	Chiton
Leptoplax verconis	Polyplacophora	Chitonida	Acanthochitonidae	Leptoplax	Chiton
Mucrosquama carnosa	Polyplacophora	Chitonida	Chitonidae	Mucrosquama	Chiton
Cryptoplax mystica	Polyplacophora	Chitonida	Cryptoplacidae	Cryptoplax	Chiton
Ischnochiton (Ischnochiton) ptychius	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Ischnochiton (Ischnochiton) contractus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton

Callochiton mayi	Polyplacophora	Chitonida	Ischnochitonidae	Callochiton	Chiton
Callochiton klemi	Polyplacophora	Chitonida	Ischnochitonidae	Callochiton	Chiton
Ischnochiton fructicosus	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Leptochiton (Leptochiton) columnarius	Polyplacophora	Lepidopleurida	Leptochitonidae	Leptochiton	Chiton
Ischnochiton (Haploplax) adelaidensis	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Rhyssoplax coxi	Polyplacophora	Chitonida	Chitonidae	Rhyssoplax	Chiton
Leptochiton (Leptochiton) badius	Polyplacophora	Lepidopleurida	Leptochitonidae	Leptochiton	Chiton
Choriplax grayi	Polyplacophora	Chitonida	Choriplacidae	Choriplax	Chiton
Callochiton elongatus	Polyplacophora	Chitonida	Ischnochitonidae	Callochiton	Chiton
Ischnochiton (Ischnochiton) mawlei	Polyplacophora	Chitonida	Ischnochitonidae	Ischnochiton	Chiton
Fissidentalium ponderi	Scaphopoda	Dentaliida	Dentaliidae	Fissidentalium	Tusk Shell
Gadila spreta	Scaphopoda	Gadilida	Gadilidae	Gadila	Tusk Shell
Paradentalium hemileuron	Scaphopoda	Dentaliida	Dentaliidae	Paradentalium	Tusk Shell
Laevidentalium erectum	Scaphopoda	Dentaliida	Laevidentaliidae	Laevidentalium	Tusk Shell
Paradentalium octopleuron	Scaphopoda	Dentaliida	Dentaliidae	Paradentalium	Tusk Shell
Cadulus vincentianus	Scaphopoda	Gadilida	Gadilidae	Cadulus	Tusk Shell
Calliodentalium crocinum	Scaphopoda	Dentaliida	Calliodentaliidae	Calliodentalium	Tusk Shell
Episiphon virgula	Scaphopoda	Dentaliida	Gadilinidae	Episiphon	Tusk Shell
Laevidentalium lubricatum	Scaphopoda	Dentaliida	Laevidentaliidae	Laevidentalium	Tusk Shell
Polyschides gibbosus	Scaphopoda	Gadilida	Gadilidae	Polyschides	
Fissidentalium edenensis	Scaphopoda	Dentaliida	Dentaliidae	Fissidentalium	Tusk Shell
Fissidentalium verconis	Scaphopoda	Dentaliida	Dentaliidae	Fissidentalium	Tusk Shell
Episiphon bordaensis	Scaphopoda	Dentaliida	Gadilinidae	Episiphon	Tusk Shell
Gadila bordaensis	Scaphopoda	Gadilida	Gadilidae	Gadila	Tusk Shell
Cadulus occiduus	Scaphopoda	Gadilida	Gadilidae	Cadulus	Tusk Shell
Entalina dorsicostata	Scaphopoda	Gadilida	Entalinidae	Entalina	Tusk Shell
Cadulus simillimus	Scaphopoda	Gadilida	Gadilidae	Cadulus	Tusk Shell
Polyschides sutherlandi	Scaphopoda	Gadilida	Gadilidae	Polyschides	
Laevidentalium largicrescens	Scaphopoda	Dentaliida	Laevidentaliidae	Laevidentalium	Tusk Shell
Gadila ludbrookae	Scaphopoda	Gadilida	Gadilidae	Gadila	Tusk Shell
Antalis longitrorsa	Scaphopoda	Dentaliida	Dentaliidae	Antalis	Tusk Shell
Striodentalium concretum	Scaphopoda	Dentaliida	Dentaliidae	Striodentalium	Tusk Shell
Fissidentalium horikoshii	Scaphopoda	Dentaliida	Dentaliidae	Fissidentalium	Tusk Shell
Polyschides andersoni	Scaphopoda	Gadilida	Gadilidae	Polyschides	
Fustiaria caesura	Scaphopoda	Dentaliida	Fustiariidae	Fustiaria	Tusk Shell
Paradentalium francisense	Scaphopoda	Dentaliida	Dentaliidae	Paradentalium	Tusk Shell
Compressidens platyceras	Scaphopoda	Gadilida	Pulsellidae	Compressidens	Tusk Shell
Gadila angustior	Scaphopoda	Gadilida	Gadilidae	Gadila	Tusk Shell

APPENDIX F

Threatened Seabirds Potentially Occurring in OA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
Antipodean albatross *Diomedea antipodensis*	V	Although endemic to New Zealand, the Antipodean albatross forages widely in open waters of the south-west Pacific Ocean, Southern Ocean, and the Tasman Sea. Satellite tracking of birds breeding at the Auckland Islands (south of New Zealand) mostly forage west of New Zealand across the Tasman Sea and south of Australia. Breeding pairs return to breeding colonies at the Auckland Islands in December. Fledglings depart the Auckland Islands between the end of January and mid-March following a year spent at the nest. Antipodean albatrosses prefer to forage at the outer shelf edge and over seamounts, particularly in areas where there are strong currents or eddies and enhanced productivity.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Southern royal albatross *Diomedea epomophora*	V	Southern royal albatrosses have a circumpolar distribution within the Southern Ocean. They range over the waters off southern Australia at all times of the year, but particularly between July and October. In Australia, they have been recorded from Byron Bay in the east to south-western Western Australia. Most records are from the shelf-break areas off eastern and southern TAS and around VIC.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Wandering albatross *Diomedea exulans*	V	Wandering albatross breed on Macquarie Island and feeds throughout the Southern Ocean. In the Australian region it forages inshore, offshore and in pelagic waters. Wandering albatrosses return to breeding sites from November, with chicks fledging from mid-November to mid-December the following year. Juveniles may forage separately to adults; however, their ranges overlap with that of adults. Wandering albatrosses of all ages have been sighted at feeding concentrations near eastern NSW, particularly between July and November, however, birds only stay for a short period.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Northern royal albatross *Diomedia sanfordi*	E	Northern royal albatross forage over the Southern Ocean, with individuals present over Australian waters off south-eastern Australia. This species regularly feeds in TAS and South Australian waters, and less frequently in NSW waters.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
White-bellied storm petrel *Fregetta grallaria*	V	White-bellied storm petrels breed on small offshore islets and rocks in the Lord Howe Island group. Its pelagic distribution is poorly known, but it has been recorded over near-shore waters off the coasts of QLD and TAS.	Species or species habitat LIKELY occur within OA and EMBA
Blue petrel *Halobaena caerulea*	V		Species or species habitat MAY occur within OA and EMBA
Southern giant petrel *Macronectes giganteus*	E	Southern Giant-Petrel breeds on six subantarctic and Antarctic islands in Australian territory; Macquarie Island, Heard Island and McDonald Island in the Southern Ocean, and Giganteus Island, Hawker Island, and Frazier Island in the Australian Antarctic Territories. They are widespread throughout the Southern Ocean, concentrating in waters above 50°S in winter months before returning to breeding colonies in August and September.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
Northern giant petrel *Macronectes halli*	V	Northern giant petrels breed on sub-Antarctic islands, foraging in Australian waters during winter months (May – October). During this time immatures and some adult birds are commonly seen in inshore and offshore waters from around Fremantle (Western Australia) to around Sydney (NSW). Northern giant petrel often forage on carrion and will often follow ships for offal and food scraps.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Fairy prion *Pachyptila turtur*	V	Blue petrels have been recorded from mainland Australia, usually between July and September.	Species or species habitat MAY occur within OA Species or species habitat KNOWN to occur within EMBA
Sooty albatross *Phoebetria fusca*	V	Sooty albatrosses are rare, but regular migrants to Australia, mostly in the autumn – winter months. They occur north to south-east QLD, NSW, VIC, TAS and South Australia. During the breeding season (summer), this species has a maximum foraging range of 2,150 km, but most adults are found within 600 km of breeding sites (islands in the Indian and Atlantic Oceans).	Species or species habitat LIKELY to occur within OA or EMBA
Gould's petrel *Pterodroma leucoptera*	E	Gould's petrel breed on Cabbage Tree Island, 1.4 km offshore from Port Stephens, NSW; the sole breeding location for this species with the exception of a few birds that potentially nest on nearby Boondelbah Island. Outside of breeding, this species predominantly forages within the Tasman Sea. Description taken from the Recovery Plan for this species.	Species or species habitat MAY occur within OA or EMBA
Soft-plumaged petrel *Pterodroma mollis*	V	Soft-plumaged petrel are found over temperate and subantarctic waters in the South Atlantic, southern Indian and western South Pacific Oceans. Although a regular visitor to southern Australian seas, it is more common in the west than in the south and south-east. In Australia, this species breeds on Maatsuyker Island off southern TAS. Sightings off south-east Australia are mostly south of TAS, between September – April.	Species or species habitat MAY occur within OA Breeding KNOWN to occur within EMBA
Australian fairy tern *Sternual nereis nereis*	V	Within Australian waters, fairy terns occur along the coast of VIC, TAS, South Australia, and Western Australia. They may migrate within southern Western Australia and TAS, where they are seen less frequently during winter months. They are more sedentary in the north of Western Australia, South Australia, and VIC.	Foraging, feeding or related behaviour LIKELY to occur within OA Species or species habitat KNOWN to occur within area
Buller's albatross *Thalassarche bulleri*	V	Buller's albatross are regular visitors to Australian waters from New Zealand breeding grounds. They are frequently seen from the coast from Coffs Harbour, south to TAS and west to Eyre Peninsula, but are most common off south-east TAS between January and April. In Australia, the species is seen over inshore, offshore, and pelagic waters where they tend to congregate over currents where the water temperature exceeds 16 °C. Buller's albatrosses take food by surface-seizing, with most of the feeding occurring during the day.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
Northern buller's albatross *Thalassarche bulleri platei*	V	This species of albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and Tasman Sea, however, birds reach the east coast of the Australian mainland. The foraging distribution of this species is not well known, however, in New Zealand, is has been observed in association with fishing boats close inshore and over waters of 180 – 360 m depth. In Australia, it occurs over inshore, offshore and pelagic waters, and off the coast of south-east TAS, particularly over waters of the East Australia Current where sea-surface temperatures are greater than 16.5 °C.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Indian yellow-nosed albatross *Thalassarche carteri*	V	Indian yellow-nosed albatrosses forage in the southern Indian Ocean. It concentrates over the productive waters of continental shelves, often at coastal upwellings, and at the boundaries of currents. In Australia, is occupies inshore and offshore waters, particularly in areas were the sea and winds are calm. Indian yellow-nosed albatrosses are most abundant in waters off southern Western Australia and South Australia between March and May. Large numbers occur in the Tasman Sea, off southern NSW in May to June. Birds more northwards along the coast where they favour inshore waters. Immature birds return south in September to October.	Species or species habitat LIKELY occur within OA and EMBA
Shy albatross *Thalassarche cauta*	E	The shy albatross is the only species of albatross endemic to Australia where it has three breeding colonies all located off TAS; Albatross Island (western Bass Strait), the Mewstone, and Pedra Branca, in southern TAS waters. Adults predominantly occur in waters adjacent to TAS and southern Australia, whereas the range of juveniles extends across the Indian Ocean to southern Africa. Description taken from Conservation Advice for this species.	Foraging, feeding or related behaviour LIKELY to occur within OA Breeding KNOWN to occur within EMBA
Grey-headed albatross *Thalassarche chryostoma*	E	The grey-headed albatross breeds in Australian waters on the southern and western flanks of Petrel Peak, Macquarie Island; an area classified as a World Heritage Area and Tasmanian Nature Reserve (managed by the Tasmanian Parks and Wildlife Service. Birds disperse widely across the Southern Ocean, at more southerly latitudes in summer than in water, when they frequent waters off southern Australia and New Zealand. Most Australian observations have been recorded south and west of TAS, and occasionally in VIC waters.	Species or species habitat MAY occur within OA Foraging, feeding or related behaviour LIKELY to occur within EMBA
Campbell albatross *Thalassarche impavida*	V	Campbell Albatrosses are non-breeding visitors to Australian waters where they are commonly seen foraging over the oceanic continental slopes of TAS, VIC, and NSW. After breeding, birds move north.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
Black-browed albatross *Thalassarche melanophris*	V	During the breeding season (September – April), this species is an uncommon visitor to the continental shelf-break of southern Australia – reaching South Australia, TAS and western and easter Bass Strait. Outside of the breeding season, birds move north, and it is during the non-breeding season when this species is common at the continental shelf and shelf-break around South Australia, VIC, TAS, western and eastern Bass Strait, and NSW.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
Salvin's albatross *Thaslasarche salvini*	V	Slavin's albatrosses are a non-breeding visitor to Australian waters. Little is known of their offshore distribution, but they are thought to roam widely during winter months.	Foraging, feeding or related behaviour LIKELY to occur within OA and EMBA
White-capped albatross *Thalassarche steadi*	V	White-capped albatross are common throughout the year off the east-coast of Australia. It occurs in inshore and offshore waters, where it enters harbour and bays, but is scarce in pelagic waters.	Foraging, feeding or related behaviour KNOWN to occur within OA and EMBA
Gibson's albatross *Diomedea antipodensis gibsoni*		In Australia, Gibson's albatrosses have been recorded foraging between Coffs Harbour (NSW), and Wilson's Promontory (VIC). Males and females forage separately, with females frequenting the Tasman Sea in the vicinity of 40 °S, with males dispersing westwards at lower latitudes or north-east towards the mid-Pacific Ocean.	Foraging, feeding or related behaviour LIKELY to occur within EMBA
Chatham albatross *Thalasarche eremita*		The principal foraging range for the Chatham albatross is in coastal waters off eastern and southern New Zealand, and TAS. It is a rare vagrant to southeast Australian waters.	Foraging, feeding or related behaviour MAY occur within EMBA.
Red knot *Calidris canutus*	E	Although this species has been identified as present within the OA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Red knot are common in all main suitable wader habitats around the Australian coast. They arrive to south Australia and TAS from August – September, before departing to breeding grounds from February – May.	Species or species habitat MAY occur within OA. Species of species habitat KNOWN to occur within EMBA
Curlew sandpiper *Calidris ferruginea*	CE	Although this species has been identified as present within the OA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Curlew sandpiper occur around coastal Australia, and are also widespread inland. They are present in Australia during the non-breeding period, with non-breeding one year old birds also remaining throughout the non-breeding season. Birds arrive to south-east Australia in late August (majority arriving in September), departing again in March.	Species or species habitat MAY occur within OA Species of species habitat KNOWN to occur within EMBA
Tasmanian wedge-tailed eagle *Aquila audax fleayi*	E	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. This species is only found in TAS and on nearby islands, where is occurs in coastal and inland regions and on large offshore islands (Flinders, Three Hummock, Schouten, Maria, and Bruny Islands). Breeding has been recorded throughout its range, with breeding occurring from late winter to summer.	Breeding LIKELY to occur within EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
Australasian bittern *Botaurus poiciloptilus*	E	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Australasian bittern inhabit wetlands around the south-east coast of Australia, including VIA, NSW, QLD, and TAS.	Species or species habitat KNOWN to occur within EMBA
Great knot *Calidris tenuirostris*	CE	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Great knots are migratory and have been recorded around the Australian coast. It is uncommon in south-west Australia, South Australia, VIC and TAS. They arrive in late August – early September, returning in March – April. Habitats for this species include large intertidal mudflats or sandflats.	Roosting KNOWN to occur within EMBA
Greater sand plover *Charadrius leschenaultii*	V	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Greater sand plovers occur in all states across Australia during the summer non-breeding season.	Species or species habitat KNOWN to occur within EMBA
Lesser sand plover *Charadrius mongolus*	E	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Lesser sand plovers are summer migrants to coastal Australia. They have been recorded across all Australian states where they are present mostly between September and April/May.	Roosting KNOWN to occur within EMBA
Nunivak bar-tailed godwit *Limosa lapponica baueri*	V	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. Nunivak bar-tailed godwits are migratory, spending summer months in all Australian states.	Species or species habitat KNOWN to occur within EMBA
Eastern curlew *Numenius madagascariensis*	CE	Although this species has been identified as present within the OA based on the results of the EPBC Act Protected Matters Report, this is a typically coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill. This species is migratory, returning to Australia from breeding sites (in Russia and north-eastern China) in August.	Species or species habitat MAY occur within OA Species or species habitat KNOWN to occur within EMBA
Eastern hooded plover *Thinornis cucullatus cucullatus*	V	Although this species has been identified as present within the EMBA based on the results of the EPBC Act Protected Matters Report, this is typically a coastal species and is therefore not expected to be encountered during the Otway Basin 3D MC MSS but is of relevance to an unplanned fuel oil spill.	Species or species habitat KNOWN to occur within EMBA

Common Name(s) Scientific Name	EPBC Act Protection Status	Distribution, Habitat and Life Stages	Potential to occur within OA and EMBA
		Eastern hooded plovers are small Australian beach nesting birds that are widely dispersed on or near sandy beaches in south-eastern Australia, including TAS and its offshore islands.	

APPENDIX G

List of Relevant Persons Consulted With

Confirmed Relevant Persons	
1	3D Oil
2	AB Hunter Fisheries
3	Abalone Council Victoria
4	Abalone Victoria Central Zone
5	Aboriginal Heritage Council Tasmania
6	Aboriginal Heritage of Tasmania (Part of the Dept Premier and Cabinet)
7	Aboriginal Land Council of Tasmania
8	Aboriginal Launceston
9	Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna
10	Apollo Bay Fishermen's Cooperative
11	Apollo Bay Landcare
12	Australian Coastal Society Ltd
13	Australian Communication and Media Authority
14	Australian Conservation Foundation
15	Australian Fisheries Management Authority
16	Australian Fishing Trade Assn
17	Australian Hydrographic Office
18	Australian Institute of Marine Science
19	Australian Marine Conservation Society
20	Australian Maritime Safety Authority
21	Australian Recreational Fishing Foundation
22	Australian Southern Bluefin Tuna Industry Association
23	Bass Strait Central Zone Scallop Fishery
24	Beach Energy
25	Beach Patrol 3280
26	Bega Local Aboriginal Land Council
27	Blue Whale Study Inc
28	Bodalla Local Aboriginal Land Council
29	Bunurong Land Council Aboriginal Corporation
30	Burrandies Aboriginal Corporation
31	Cape Barren Island Aboriginal Association Incorporated
32	Centre for Whale Research
33	CGG
34	Circular Head Aboriginal Corporation
35	Circular Head Council
36	Coastcare Victoria
37	Colac Otway Shire Council

Confirmed Relevant Persons	
38	Commissioner for Environmental Sustainability of Victoria (Department of Energy, Environment and Climate Action)
39	Commonwealth Fisheries Association
40	ConocoPhillips
41	Conservation Council of SA
42	Cooper Energy
43	Corangamite Shire Council
44	Deakin University - School of Life and Environmental Sciences
45	Department of Agriculture, Fisheries and Forestry
46	Department of Climate Change, Energy, the Environment and Water
47	Department of Defence
48	Department of Energy and Mining
49	Department of Energy, Environment and Climate Action
50	Department of Environment and Water
51	Department of Mining, Exploration and Geoscience
52	Department of Natural Resources and Environment Tasmania
53	Department of Planning and Environment
54	Marine Safety SA (Part of Department for Infrastructure and Transport SA)
55	Department of Primary Industries (Marine Environment/Marine Parks)
56	Department of Primary Industries and Regions South Australia
57	Department of State Growth - Mineral Resources Tasmania
58	Department of Transport and Planning
59	Discover Tasmania
60	District Council of Grant
61	Diving Industry Of Victoria Association Inc
62	East Gippsland Shire Council
63	Eastern Maar Aboriginal Corporation
64	Eastern Zone Abalone Industry Association
65	Eden Local Aboriginal Land Council
66	Elders Council of Tasmania Aboriginal Corporation
67	Environment Tasmania
68	Environmental Protection Authority - South Australia
69	Environmental Protection Authority - Tasmania
70	Environmental Protection Authority - Victoria
71	First Nations Legal and Research Services (Victoria)
72	First Nations of the South-East
73	First Tasmanians Aboriginal Corporation
74	Fisheries Research and Development Corporation

Confirmed Relevant Persons	
75	Flinders Council
76	Flinders Ports
77	Friends of the Bay of Islands Coastal Park
78	Geoscience Australia
79	Glenelg Shire Council
80	Great Australian Bight Right Whale Study
81	Gulaga and Biamanga Joint Authority
82	Gunaikurnai Land and Waters Aboriginal Corporation RNTBC
83	Gunditj Mirring Traditional Owners Aboriginal Corporation
84	International Fund for Animal Welfare
85	Karadi Aboriginal Corporation
86	King Island Boat Club
87	King Island Landcare Tasmania
88	King Island Shire Council
89	King Island Tourism
90	Lia Pootah Aboriginal Corporation
91	Marine and Safety Tasmania
92	Marine Mammal Foundation
93	Maritime Safety Victoria (Part of Transport Safety Victoria)
94	MD Australia Oceanographic Services Pty Ltd
95	melythina tiakana warrana Aboriginal Corporation
96	Merrimans Local Aboriginal Land Council
97	Mornington Peninsula Shire Council
98	Moyne Shire Council
99	National Native Title Tribunal
100	National Offshore Petroleum Titles Administrator
101	National Parks and Wildlife Services South Australia - Marine Parks
102	New South Wales Aboriginal Land Council
103	New South Wales National Parks and Wildlife Service
104	Ngarrindjeri Aboriginal Corporation RNTBC (SA) Ngarrindjeri Ruwe Empowered Communities (SA)
105	NTSCORP Ltd
106	Ocean Racing Club of Victoria
107	Otway Climate Emergency Action Network
108	Parks Victoria
109	Parrdarrama Pungenna Aboriginal Corporation
110	Port of Melbourne Corporation
111	Port Phillip EcoCentre

Confirmed Relevant Persons	
112	Ports Victoria
113	RecFish SA
114	Scallop Fisherman's Association of Tasmania Inc
115	Scuba Divers Federation of South Australia, Inc
116	SCUBA Divers Federation of Victoria
117	Seafood Industry Australia (SIA)
118	Seafood Industry Victoria (SIV)
119	Six Rivers Aboriginal Corporation
120	Small Pelagic Fishery Industry Association
121	South Australian Native Title Services
122	South Australian Rock Lobster Advisory Council Inc.
123	South Australian Rock Lobster Fishery
124	South East Tasmanian Aboriginal Corporation
125	South East Trawl Fishing Industry Association
126	South Eastern Professional Fishermen's Assn Inc
127	South Gippsland Shire Council
128	Southern Coast Charters (King Island Dive Adventure)
129	Southern Ocean Protection Embassy Collective
130	Southern Rock Lobster Limited
131	Southern Shark Industry Alliance Inc.
132	SUBCO Pty Ltd
133	Superfresh Scallops
134	Superloop Ltd
135	Surf Coast Shire Council
136	Surfers for Climate
137	Surfrider Foundation Australia
138	Tasman Council
139	Tasmanian Aboriginal Centre Inc
140	Tasmanian Association for Recreational fishing
141	Tasmanian Conservation Trust
142	Tasmanian Regional Aboriginal Communities Alliance
143	Tasmanian Rock Lobster Fisherman's Association
144	Tasmanian Seafood Industry Council
145	TasPorts
146	The Wilderness Society
147	Tourism Industry Council of Tasmania
148	Tourism SA
149	Transport for NSW

Confirmed Relevant Persons	
150	Tuna Australia (ETBF Industry Association)
151	University of Tasmania (UTAS) - Institute for Marine and Antararctic Studies
152	Victorian Fisheries Authority
153	Victorian Scallop Fishermans Association Inc.
154	VR Fish (Victorian Recreational Fishing Peak Body)
155	Wadawurrung Traditional Owners Aboriginal Corporation
156	Wagonga Local Aboriginal Land Council
157	Warrnambool City Council
158	Warrnambool Coastcare Landcare Network Inc
159	Wattle Range Council
160	Weetapoona Aboriginal Corporation
161	Wellington Shire Council
162	Western Abalone Divers Assn (Abalone Western Zone)
163	Wildcatch Fisheries South Australia Inc

Persons Engaged with but not Considered Relevant	
1	Anangu Pitjantjatjara Land Council
2	Bass Coast Shire Council
3	Bega Valley Shire Council
4	Boating Industry Association of SA
5	Burnie Council
6	Central Coast Council
7	Commission for the Conservation of Southern Bluefin Tuna
8	CSIRO
9	Department of Infrastructure, Transport, Regional Development, Communication and the Arts
10	Devonport City Council
11	District Council of Ceduna
27	District Council of Lower Eyre Peninsula
12	Dorset Council
13	Environment Victoria
14	Environmental Protection Authority - New South Wales
15	Flinders Island Aboriginal Association Inc (Tas)
16	George Town Council
17	Huon Valley Council
18	Kangaroo Island Council
19	Kingborough Council
20	Latrobe Council

Persons Engaged with but not Considered Relevant	
21	Marine Fisheries Association Inc (South Australia)
22	Parks and Wildlife Services Tasmania
23	Visit Victoria
24	Waratah-Wynyard Council
25	West Coast Council
26	West Tamar Council

APPENDIX H

Full Unedited Correspondence

Sensitive information – content removed.

APPENDIX I

Meeting Minutes and Memos

Sensitive information – content removed.

APPENDIX J

Information Sheets and Public Notifications

- General Information Sheet – Commercial Fishing Groups Rev 1 May 2022
- General Information Sheet Rev 2 February 2023
- Traditional Owner Information Sheet Rev 3 March 2023
- General Information Sheet Rev 4 April 2023
- General Meeting Flyer March 2023
- Bega Local Aboriginal Land Council Meeting Flyer March 2023
- Warrnambool Standard Advertisement – Community Information Session 20 May 2023
- Warrnambool Standard Advertisement – Community Information Session 27 May 2023
- King Island Courier Advertisement – Community Information Session 15 June 2023
- King Island Courier Advertisement – Community Information Session 22 June 2023

STAKEHOLDER CONSULTATION INFORMATION SHEET

Otway Basin 3D Multi-client Marine Seismic Survey

TGS Schlumberger

TGS and Schlumberger are proposing to undertake a three-dimensional (3D) multi-client marine seismic survey (MSS) in the Otway Basin, in Commonwealth waters offshore from Victoria (VIC), Tasmania (TAS) and South Australia (SA).

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, TGS and Schlumberger are preparing an Environment Plan (EP) for the survey for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

TGS and Schlumberger welcome your feedback on the proposed survey activity.

PROPOSED ACTIVITY

Marine seismic surveying is used to improve the understanding of subsurface geology in marine environments. During marine seismic surveys, seismic data is acquired using a purpose-built seismic survey vessel towing an acoustic source and multiple cables of hydrophones, also known as streamers. Streamers are towed with a tail buoy, radar reflectors and lights to mark the end of the array. The streamers will be up to 9 km long to adequately record the necessary information. Both the source and streamers are towed beneath the surface (**Figure 1**). Acoustic energy from the acoustic source is detected by the streamers and recorded on board the vessel. The recorded signals are then processed to provide information about geological formations below the seabed.

When recording the data, the seismic vessel traverses the survey area along a series of pre-determined sail lines at a speed of approximately 4 – 5 knots (7.5 – 9.5 km/hr). The level of acoustic emissions can be adjusted to provide low-power 'soft start' or 'fauna alert' procedures, at any point during the survey or maintenance operations.

Support vessels will work with the seismic vessel to assist in communicating with other vessels that have entered the area of operations and to support the overall operations, such as providing food and supplies.

Table 1 on the following page provides a summary of the Otway Basin 3D Multi-client MSS.

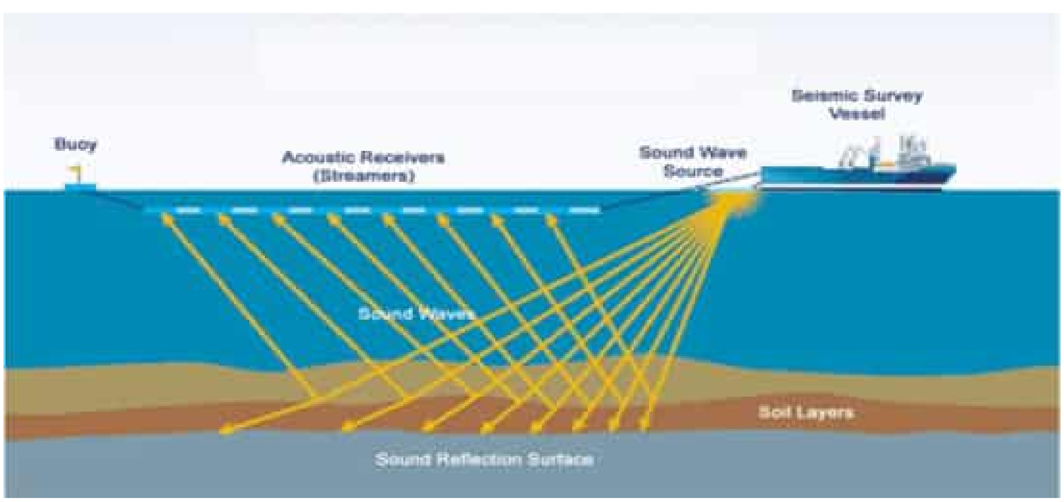


Figure 1 – Schematic illustrating a typical marine seismic survey

SURVEY AREAS

The proposed Otway Basin 3D Multi-client MSS comprises the following areas (Figure 2):

- An 'Active Source Area'; and
- A broader 'EP Area'.

The Active Source Area includes areas where prospective clients may be interested in acquiring seismic data in the foreseeable future. It includes the space where data acquisition may occur, plus additional space for the survey vessel to "run-in" to or "run-out" of sail lines while the acoustic source is active.

The Active Source Area includes the main '3D Active Source Area' where 3D seismic data may be acquired. During 3D seismic data acquisition, the seismic vessel travels back and forth along pre-determined parallel sail lines which are acquired in a "race track" pattern, whereby the vessel turns at the end of each sail line and returns in the opposite direction along a different sail line. 3D sail lines will be orientated approximately parallel with the seabed contours (approximately north-west/south-east).

The 3D Active Source Area includes water depths between approximately 510 m and 5,650 m, therefore, the acoustic source will not be operated in shallower continental shelf waters during 3D seismic data acquisition.

In addition, up to three single 2D lines may be acquired to "tie-in" to existing geophysical data in the region. The 2D tie-in lines will be acquired approximately perpendicular to the seabed contours (approximately south-west/north-east). Each tie-in line will be up to a maximum of 150 km in length (less than a day of acquisition time). The tie-in lines will overlap with 3D data acquisition in the 3D Active Source Area, however, one of the 2D tie-in lines may need to extend onto the continental shelf. Consequently, a '2D Tie-line Active Source Area Extension' is included in addition to the primary 3D Active Source Area. Operation of the acoustic source in the 2D Tie-line Active Source Area Extension will be limited only to a single 2D tie-in line. At the shallowest point, the 2D Tie-line Active Source Area Extension is approximately 115 m. The 3D Active Source Area, 2D Tie-line Active Source Area Extension and indicative 2D tie-in line are presented in Figure 2.

The broader EP Area includes space required for vessel turns and other vessel operations that may be required beyond the extent of the Active Source Area. It includes waters depths from approximately 95 m to 5,650 m.

Table 1 – Otway Basin 3D Multi-client MSS Summary

Earliest commencement	1 December 2022 (pending regulatory approvals, environmental sensitivities and vessel availability).	
Estimated completion	Pending acceptance by NOPSEMA, the EP will be valid until 30 November 2027.	
Estimated survey duration	Depends upon the areas of interest from petroleum titleholders in the region. The survey may be acquired in multiple survey mobilisations over the duration of the EP. In any year, the maximum acquisition time is expected to be 200 days, but it may be less. This includes some contingency time for potential vessel or equipment downtime and adverse weather conditions. Survey timing will take into account the seasonality of environmental and socio-economic sensitivities wherever practicable and to reduce potential impacts to an acceptable level.	
Water depth	Approximately 510 m to 5,650 m in the 3D Active Source Area, reducing to Approximately 115 m in the 2D Tie-line Active Source Area Extension. The EP Area includes water depths from 95 m to 5,650 m.	
Vessels	One purpose-built seismic survey vessel, plus additional support vessels. Vessel details have not yet been confirmed.	
Survey vessel speed	Approximately 4 – 5 knots (7.5 – 9.5 km/hour).	
Length and spread of towed equipment	Approx. 8 – 10 km length. Approx. 800 m – 1.6 km wide.	
Area of avoidance	3 nautical miles requested around the survey vessel and streamers.	
Proximity to key locations	**Location**	**Approximate Distance to EP Area**
	Portland (VIC)	48 km
	Warrnambool (VIC)	61 km
	Arthur River (TAS)	85 km
	King Island	39 km
	Robe (SA)	64 km

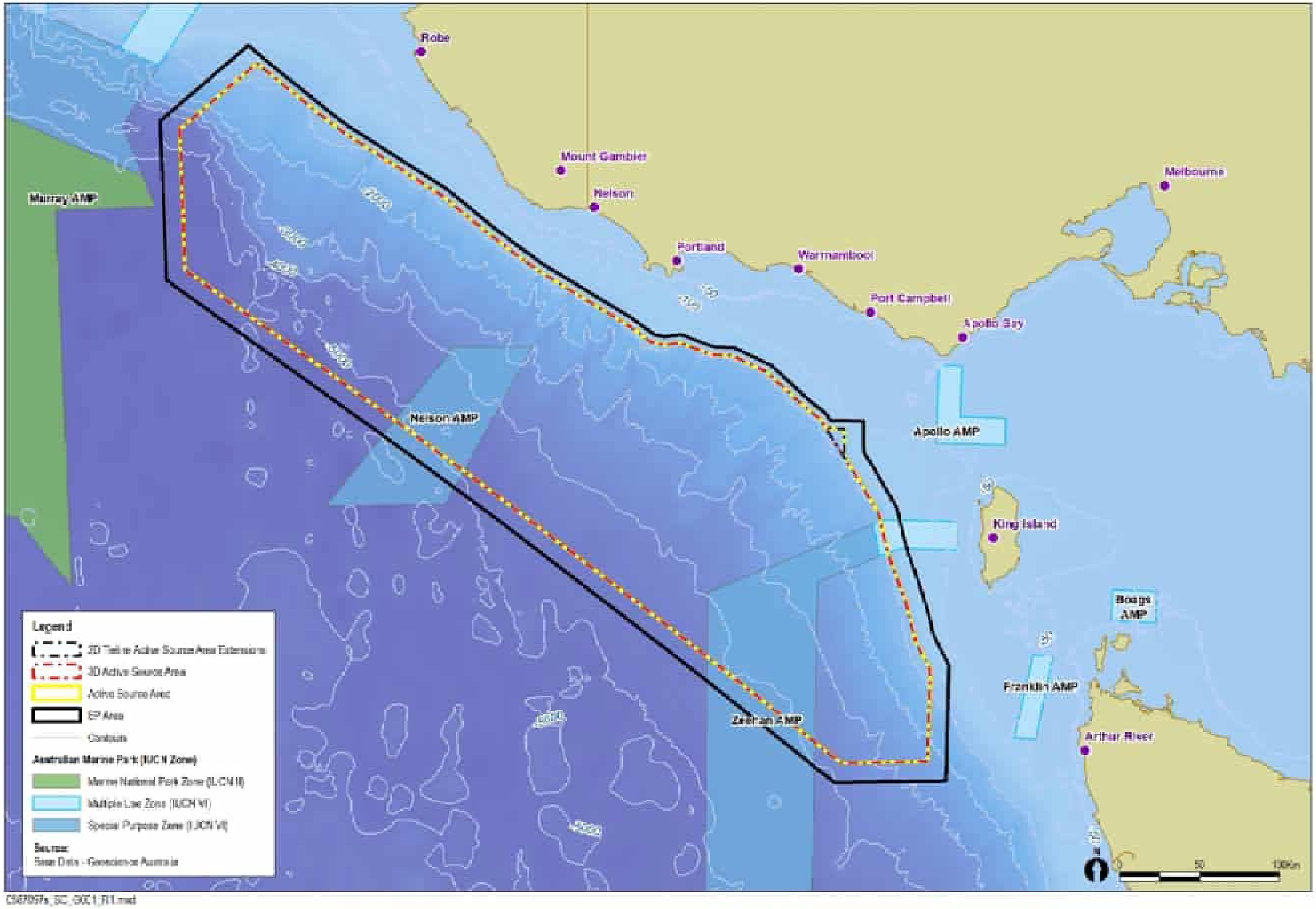


Figure 2 – Location of the proposed Otway Basin 3D Multi-client MSS

ENVIRONMENTAL PERFORMANCE

TGS and Schlumberger have a reputation for implementing high standards of environmental protection in environmentally sensitive areas to mitigate and minimise impacts on the surrounding marine environment and stakeholders. TGS and Schlumberger are committed to working with all interested parties to ensure risks are identified and reduced to as low as reasonably practicable before activities begin.

A summary of key environmental management measures associated with the Otway Basin 3D Multi-client MSS are summarised below. These management measures will be implemented as a minimum. Additional management measures may also be identified during stakeholder engagement and development of the EP.

UNDERWATER NOISE

- Precaution zones, pre-start observations, soft-start procedures, low-power and shut-down procedures, in accordance with EPBC Policy Statement 2.1.
- Marine fauna observers will be present on the survey vessel.
- Passive Acoustic Monitoring (PAM).
- Operation of the seismic source in water depths less than 500 m will be limited to a few hours for a single 2D tie-in line.
- Subject to the outcomes of acoustic modelling and further assessment, additional control measures and adaptive management procedures will be considered.

INTERACTIONS WITH MARINE FAUNA

- Vessels will not exceed a speed of 6 knots or actively approach within the caution zone of a cetacean in accordance with EPBC Regulations 2000 - Part 8 Division 8.1.
- Caution zones and speed restrictions will also be implemented for marine turtles.
- Tail buoys on streamers will be of a design that reduces the risk of entrapment.

INTERACTIONS WITH FISHERIES

- Seismic data acquisition in water depths less than 500 m will be limited to a single 2D tie-in line to minimise interaction with most fisheries.
- Notifications will be provided to fisheries stakeholders 4 weeks prior to commencement of the survey, indicating the location and expected timing.
- Daily look-ahead reports, detailing upcoming survey activities within the next 48 hours, will be available via email to fisheries stakeholders who register for this service.
- Access to seismic vessel tracking information via Google Earth, will be made available to fisheries stakeholders who register for this service.
- Notifications will be provided to fisheries stakeholders upon completion of the survey.

INTERACTION WITH OTHER MARINE USERS

- Notice to Mariners and notification to the AMSA Joint Rescue Coordination centre (JRCC) will be issued prior to survey commencement.
- Vessels will maintain appropriate lighting, signals, navigation and communication at all times, in compliance with the *Navigation Act 2012* and associated Marine Orders.
- Tail buoys on streamers will be fitted with lights and radar reflectors.
- At least one support vessel will accompany the survey vessel during seismic operations.

VESSEL MANAGEMENT

- Vessel emissions, discharges and waste management will comply with the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL), the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and associated Marine Orders.
- Vessels will meet the requirements of the *Biosecurity Act 2015* and will manage ballast water in accordance with the Australian Ballast Water Management Requirements.
- TGS will develop an Oil Pollution Emergency Plan (OPEP) for the survey.
- All vessels will have Shipboard Oil Pollution Emergency Plans (SOPEPs).

Frequently Asked Questions

Q. WHAT IS A 'MULTI-CLIENT' SEISMIC SURVEY?

Seismic surveys are conducted on either a multi-client or proprietary basis. Proprietary surveys are acquired for an individual petroleum titleholder, and the coverage of the survey is usually limited to the titleholder's petroleum permit area. In contrast, multi-client surveys are acquired by a geophysical survey company and are generally collected over larger areas where there may be future interest in oil and gas prospects.

Geophysical companies (in this case, TGS and Schlumberger) collect the data which is then licensed to multiple clients (i.e. multiple titleholders). Although multi-client surveys may cover large areas, a key advantage of a multi-client seismic survey is that the data may be acquired by a single seismic survey, and so fewer seismic surveys are likely to be required in the region.

Q. WILL THE SEISMIC SURVEY OCCUR OVER THE ENTIRE EP AREA?

The defined Active Source Area and EP Area represent the maximum area where TGS and Schlumberger will apply for permission to acquire the Otway Basin 3D Multi-client MSS. The actual area that will be surveyed will depend on the level and areas of interest received from petroleum titleholders in the region, and if TGS and Schlumberger are engaged to acquire seismic data on their behalf. Therefore, there may be areas that are never surveyed, but the EP and stakeholder consultation consider the maximum area for the purposes of environmental management.

When specific survey areas are identified, the areas and proposed commencement dates will be communicated to stakeholders will be communicated to stakeholders.

Q. WHAT HAVE TGS AND SCHLUMBERGER DONE TO AVOID ENVIRONMENTALLY SENSITIVE AREAS IN SHALLOW WATERS?

TGS and Schlumberger have made a conscious effort to limit survey overlap with the continental shelf and shallow nearshore waters. The 3D Active Source Area does not extend into waters shallower than 510 m; only one 2D tie-in line will require the use of the acoustic source in shallower waters. The decision was made to limit activities to deeper, offshore waters in order to reduce the potential effects on marine fauna and commercial fisheries in nearshore waters.

Q. WHAT MARINE FAUNA MIGHT BE AFFECTED?

A number of whale and dolphin species occur in the region. These include pygmy blue whales, which are typically present in the region to forage during the summer and autumn months. The presence of the Bonny Upwelling provides nutrient rich waters, and the continental shelf is known as a biologically important area for the foraging by this species. The Active Source Area has been designed to limit overlap with these foraging areas.

Coastal and continental shelf waters also support species such as southern right whales, fur seals, sea lions and little penguins. However, given that the 3D Active Source Area is limited to waters greater than 510 m water depth, limited disturbance to these species and their habitats in nearshore waters is expected.

Various fish and shellfish species may also be present in the survey area, including commercially significant fish species, rock lobster and giant crab. Potential impacts to these species and stock recruitment will be considered in the EP.

Acoustic modelling and a detailed impact assessment will be undertaken to understand the potential impacts to marine fauna and identify appropriate management measures.

Frequently Asked Questions

Q. WILL COMMERCIAL FISHERIES BE AFFECTED?

The Active Source Area and EP Area have limited overlap with commercial fisheries. Most commercial fishing activity occurs on the continental shelf and along the continental shelf break, which lie on the periphery of the Active Source Area and EP Area. While many fishing activities will be avoided, there is still the potential for some interaction with some State-managed fish, rock lobster and giant crab fisheries, the Commonwealth Trawl Sector, and the Southern Bluefin Tuna Fishery, in the event that the seismic vessel operates near the edge of the continental shelf. TGS and Schlumberger will consult with commercial fishing stakeholders to improve understanding of these fisheries and identify suitable measures to manage impacts.

Q. HOW WILL INTERACTIONS WITH FISHERIES BE MANAGED?

It is TGS and Schlumberger's intention to carry out the Otway Basin 3D Multi-client MSS in a manner that does not interfere with fishing or the resources of the sea, to a greater extent than is necessary. However, it is noted that there is the potential for the survey to interact with fishing activities.

TGS and Schlumberger cannot restrict fishing access to the Operational Area and will consider concurrent operational planning options with commercial fishers. TGS will also provide notifications to fishers prior to the commencement of the survey as well as regular updates during survey activities. Open radio communications will also be maintained with fishing vessels.

Q. WILL TGS COMPENSATE FISHERS FOR INTERRUPTION TO THEIR FISHING ACTIVITIES?

TGS and Schlumberger believe that commercial fishers and fishing charter boat operators should not be unfairly disadvantaged by the Otway Basin 3D Multi-client MSS .

Should fishers be genuinely impacted by the Otway Basin 3D Multi-client MSS, TGS and Schlumberger will consider claims on a case-by-case basis.

YOUR FEEDBACK

TGS and Schlumberger are seeking your feedback regarding this proposed activity before making a formal EP submission to NOPSEMA. If you would like to comment on the survey, request additional information, or meet with us to discuss the survey, please contact us as soon as possible.

All communications will be logged, assessed and acknowledged with a response, and incorporated into the EP. In accordance with regulatory requirements, full copies of correspondence with stakeholders will be provided to NOPSEMA. However, this information and any other information determined to be sensitive will not be made public. Stakeholders are also advised to inform TGS if any information provided is confidential and not to be published in the EP.

In addition, once the EP is submitted to NOPSEMA, it will be published on the NOPSEMA website for a 30-day public comment period. TGS and Schlumberger will provide relevant stakeholders with a notification of the commencement of the public comment period.

If you would like to provide comment or request further information on the Otway Basin 3D Multi-client MSS, please contact:

Email: TGSSLB_OtwayBasin3D@erm.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

Schlumberger

STAKEHOLDER CONSULTATION INFORMATION SHEET

Otway Basin 3D Multi-client Marine Seismic Survey

TGS

TGS is proposing to undertake a three-dimensional (3D) multi-client marine seismic survey (MSS) in the Otway Basin, in Commonwealth waters offshore of Victoria and Tasmania.

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, TGS are preparing an Environment Plan (EP) for the survey for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

TGS welcomes your feedback on the proposed survey activity

PROPOSED ACTIVITY

Marine seismic surveying is used to improve the understanding of subsurface geology in marine environments. During marine seismic surveys, seismic data is acquired using a purpose-built seismic survey vessel towing an acoustic source and multiple cables of hydrophones, also known as streamers. Streamers are towed with a tail buoy, radar reflectors and lights to mark the end of the array. The streamers will be up to 9 km long to adequately record the necessary information. Both the source and streamers are towed beneath the surface of the water (Figure 1). Acoustic energy from the acoustic source is detected by the streamers and recorded on board the vessel. The recorded signals are then processed to provide information about geological formations below the seabed.

When recording the data, the seismic vessel traverses the survey area along a series of pre-determined sail lines at a speed of approximately 4 – 5 knots (7.5 – 9.5 km/hr). The level of acoustic emissions can be adjusted to provide low-power ‘soft start’ or ‘fauna alert’ procedures, at any point during the survey or maintenance operations.

Support vessels will work with the seismic vessel to assist in communicating with other vessels that have entered the area of operations and to support the overall operations, such as providing food and supplies.

Table 1 on the following page provides a summary of the Otway Basin 3D Multi-client MSS.

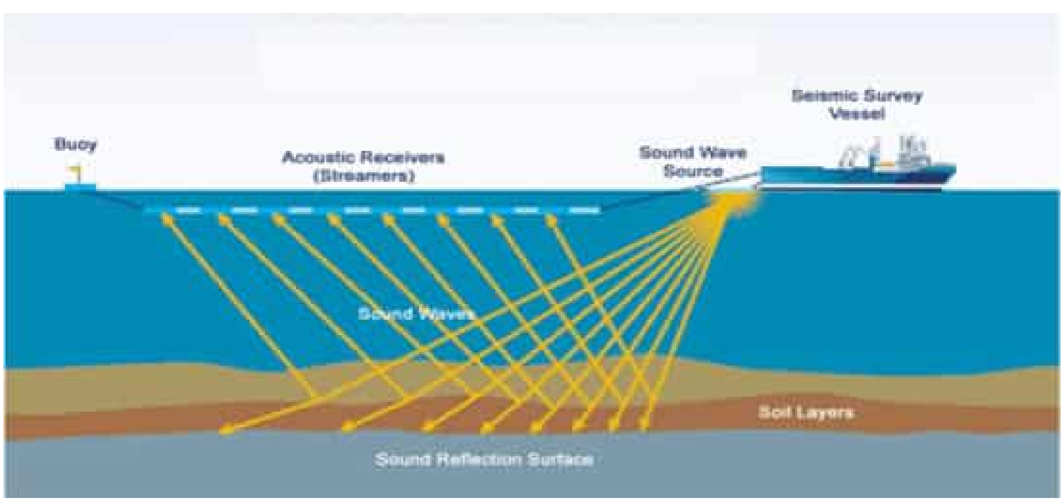


Figure 1 – Schematic illustrating a typical marine seismic survey

SURVEY AREAS

The proposed Otway Basin 3D Multi-client MSS comprises the following areas (**Figure 2**):

- An 'Active Source Area'; and
- A broader 'EP Area'.

The Active Source Area includes areas where prospective clients may be interested in acquiring seismic data in the foreseeable future. It includes the space where data acquisition may occur, plus additional space for the survey vessel to "run-in" to or "run-out" of sail lines while the acoustic source is active.

The Active Source Area includes the main '3D Active Source Area' where 3D seismic data may be acquired. During 3D seismic data acquisition, the seismic vessel travels back and forth along pre-determined parallel sail lines which are acquired in a "race track" pattern, whereby the vessel turns at the end of each sail line and returns in the opposite direction along a different sail line. 3D sail lines will be orientated approximately parallel with the seabed contours (approximately north-west/south-east).

The 3D Active Source Area includes water depths between approximately 510 m and 5,650 m, therefore, the acoustic source will not be operated in shallower continental shelf waters during 3D seismic data acquisition.

In addition, up to five single 2D lines may be acquired to "tie-in" to existing geophysical data in the region. The 2D tie-in lines will be acquired approximately perpendicular to the seabed contours (approximately south-west/north-east). Each tie-in line will be up to a maximum of 150 km in length (less than a day of acquisition time). The tie-in lines will overlap with 3D data acquisition in the 3D Active Source Area; however, one of the 2D tie-in lines may need to extend onto the continental shelf. Consequently, a '2D Tie-line Active Source Area Extension' is included in addition to the primary 3D Active Source Area. Operation of the acoustic source in the 2D Tie-line Active Source Area Extension will be limited only to a single 2D tie-in line. At the shallowest point, the 2D Tie-line Active Source Area Extension is approximately 115 m. The 3D Active Source Area, 2D Tie-line Active Source Area Extension and indicative 2D tie-in line are presented in **Figure 2**.

The broader EP Area includes space required for vessel turns and other vessel operations that may be required beyond the extent of the Active Source Area. It includes waters depths from approximately 95 m to 5,650 m.

Table 1 – Otway Basin 3D Multi-client MSS Summary

Earliest commencement	1 October 2023 (pending regulatory approvals, environmental sensitivities and vessel availability).	
Estimated completion	Pending acceptance by NOPSEMA, the EP will be valid until 30 September 2027.	
Estimated survey duration	Depends upon the areas of interest from petroleum titleholders in the region. The survey may be acquired in multiple survey mobilisations over the duration of the EP. In any year, the maximum acquisition time is expected to be 200 days, but it may be less. This includes some contingency time for potential vessel or equipment downtime and adverse weather conditions. Survey timing will take into account the seasonality of environmental and socio-economic sensitivities wherever practicable and to reduce potential impacts to an acceptable level.	
Water depth	Approximately 510 m to 5,650 m in the 3D Active Source Area, reducing to approximately 115 m in the 2D Tie-line Active Source Area Extension. The EP Area includes water depths between 95 m – 5,650 m.	
Vessels	One purpose-built seismic survey vessel, plus additional support vessels. Vessel details have not yet been confirmed.	
Survey vessel speed	Approximately 4 – 5 knots (7.5 – 9.5 km/hour).	
Length and spread of towed equipment	Approximately 8 – 10 km length. Approximately 800 m – 1.6 km wide.	
Area of avoidance	3 nautical miles requested around the survey vessel and streamers.	
Proximity to key locations	**Location**	**Approximate Distance to EP Area**
	Portland (VIC)	48 km
	Warrnambool (VIC)	61 km
	Arthur River (TAS)	85 km
	King Island (TAS)	39 km
	Robe (SA)	64 km

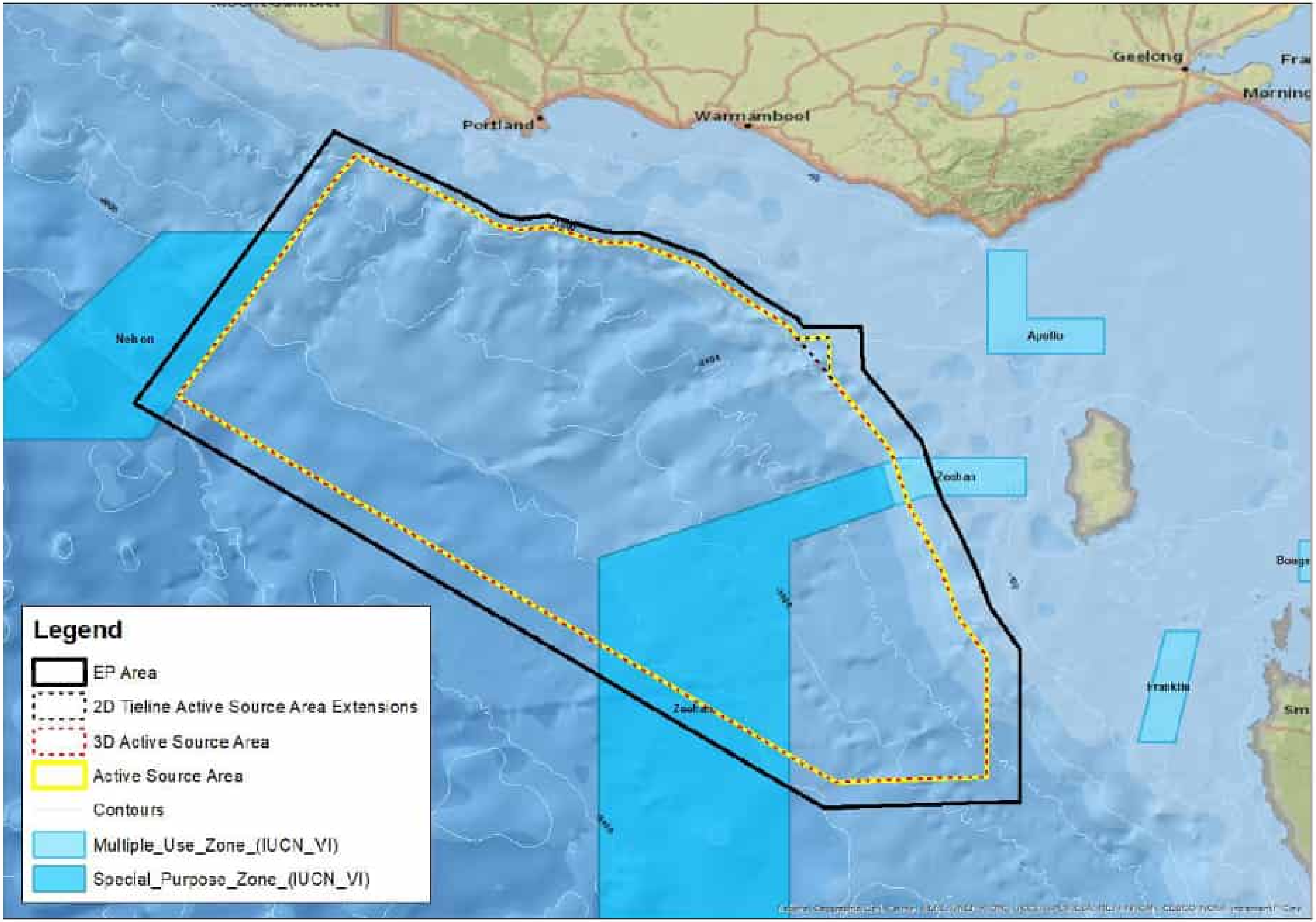


Figure 2 – Location of the proposed Otway Basin 3D Multi-client MSS

ENVIRONMENTAL PERFORMANCE

TGS has a reputation for implementing high standards of environmental protection in environmentally sensitive areas to mitigate and minimise impacts on the surrounding marine environment and stakeholders. TGS is committed to working with all interested parties to ensure concerns and risks are identified and reduced to as low as reasonably practicable before activities begin and throughout the project duration.

A summary of key environmental management measures associated with the Otway Basin 3D Multi-client MSS are summarised below. These management measures will be implemented as a minimum. Additional management measures may also be identified during stakeholder engagement and development of the EP.

UNDERWATER NOISE

- TGS will implement precaution zones, pre-start observations and soft-start, low-power and shut-down procedures in accordance with EPBC Policy Statement 2.1 – Interaction with whales.
- Marine fauna observers will be present on the survey vessel throughout the survey duration.
- Operation of the seismic source in water depths < 500 m will be limited to a few hours for a single 2D tie-in line.
- Subject to the outcomes of acoustic modelling and further assessment, additional control measures and adaptive management procedures will be considered.

INTERACTIONS WITH FISHERIES

- Seismic data acquisition in water depths less than 500 m will be limited to a single 2D tie-in line to minimise interaction with most fisheries.
- Fisheries stakeholders will be notified four weeks prior to commencement of the survey, providing the location and expected timing.
- Daily look-ahead reports, detailing upcoming survey activities within the next 48 hours, will be emailed to fisheries stakeholders who register for this service.
- Fisheries stakeholders will be notified upon completion of the survey.

INTERACTIONS WITH MARINE FAUNA

- Vessels will not exceed a speed of 6 knots or actively approach within the caution zone of a cetacean in accordance with EPBC Regulations 2000 - Part 8 Division 8.1.
- Strict caution zones and speed restrictions also apply for marine turtles.
- Tail buoys on streamers will be designed to reduce the risk of entrapment.

INTERACTION WITH OTHER MARINE USERS

- Notice to Mariners and notification to the AMSA Joint Rescue Coordination centre (JRCC) will be issued prior to survey commencement.
- Vessels will maintain appropriate lighting, signals, navigation and communication at all times, in compliance with the *Navigation Act 2012* and associated Marine Orders.
- Tail buoys on streamers will be fitted with lights and radar reflectors.
- At least one support vessel will accompany the survey vessel during seismic operations.

VESSEL MANAGEMENT

- Vessel emissions, discharges and waste management will comply with the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL), the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and associated Marine Orders.
- Vessels will manage ballast water in accordance with the Australian Ballast Water Management Requirements and the *Biosecurity Act 2015.*
- TGS will implement an Oil Pollution Emergency Plan (OPEP) for the duration of the survey.
- All vessels will have Shipboard Oil Pollution Emergency Plans (SOPEPs).

FURTHER CONSULTATION

WE WANT TO HEAR FROM YOU

We are contacting you because our assessment of values and sensitivities show there may be overlap with areas that are important to you. Therefore, we would like to understand the following:

- Do you have any functions, interests or activities that may be affected by the proposed activities to be carried out under the Environment Plan?
- Do you want to meet with TGS, either in person or via video conference to discuss the proposed activities to be carried out under the Environment Plan?

OUR COMMITMENT

- TGS is committed to maintaining regular communication with all relevant persons throughout the duration of the survey and works with communities in a transparent manner. This will be supported with the supply of 48-hour operational detail lookahead plans which will be distributed every 24 hours, with notification being provided to relevant persons during operations.
- If you wish to receive these notifications or specific information regarding this survey, please advise as soon as possible.

YOUR FEEDBACK

TGS is seeking your feedback regarding this proposed activity before making a formal EP submission to NOPSEMA. If you would like to comment on the survey, request additional information, or meet with us to discuss the survey, please contact us as soon as possible.

All communications will be logged, assessed and acknowledged with a response, and incorporated into the EP. In accordance with regulatory requirements, full copies of correspondence with stakeholders will be provided to NOPSEMA. However, this information and any other information determined to be sensitive will not be made public. Stakeholders are advised to inform TGS if any information provided is confidential and not to be published in the EP.

In addition, once the EP is submitted to NOPSEMA, it will be published on the NOPSEMA website for a 30-day public comment period. TGS will provide relevant stakeholders with a notification of the commencement of the public comment period.

If you would like to provide comment or request further information on the Otway Basin 3D Multi-client MSS, please contact TGS:

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

FREQUENTLY ASKED QUESTIONS

Q. WHAT IS A 'MULTI-CLIENT' SEISMIC SURVEY?

Seismic surveys are conducted on either a multi-client or proprietary basis. Proprietary surveys are acquired for an individual petroleum titleholder, and the coverage of the survey is usually limited to the titleholder's petroleum permit area. In contrast, multi-client surveys are acquired by a geophysical survey company and are generally collected over larger areas where there may be future interest in oil and gas prospects.

Geophysical companies (in this case, TGS) collect the data which is then licensed to multiple clients (i.e. multiple titleholders). Although multi-client surveys may cover large areas, a key advantage of a multi-client seismic survey is that the data may be acquired by a single seismic survey, and so fewer seismic surveys are likely to be required in the region.

Q. WILL THE SEISMIC SURVEY OCCUR OVER THE ENTIRE EP AREA?

The defined Active Source Area and EP Area represent the maximum area where TGS will apply for permission to acquire the Otway Basin 3D Multi-client MSS. The actual survey area that will be surveyed will depend on the level and areas of interest received from petroleum titleholders in the region, and if TGS are engaged to acquire seismic data on their behalf. Therefore, there may be areas within the EP Area that are never surveyed, but the EP and stakeholder consultation consider the maximum area for the purposes of environmental management.

When specific survey areas are confirmed, the areas and proposed commencement dates will be communicated to stakeholders.

Q. WHAT HAS TGS DONE TO AVOID ENVIRONMENTALLY SENSITIVE AREAS?

TGS has made a conscious effort to limit survey overlap with the continental shelf and shallow nearshore waters. The 3D Active Source Area does not extend into waters shallower than 510 m; only one 2D tie-in line will require the use of the acoustic source in shallower waters. The decision was made to limit activities to deeper, offshore waters in order to reduce the potential effects on marine fauna and commercial fisheries in nearshore waters.

Q. WHAT MARINE FAUNA MIGHT BE AFFECTED?

A number of whale and dolphin species occur in the region. These include pygmy blue whales, which are typically present in the region to forage during the summer and autumn. The presence of the Bonney Upwelling provides nutrient rich waters, and the continental shelf is known as a biologically important area for the foraging by this species. The Active Source Area has been designed to minimise overlap with these foraging areas.

Coastal and continental shelf waters also support species such as southern right whales, fur seals, sea lions and little penguins. However, given that the 3D Active Source Area is limited to waters greater than 510 m water depth, limited disturbance to these species and their habitats in nearshore waters is expected.

Various fish and shellfish species may also be present in the survey area, including commercially significant fish species, rock lobster and giant crab. Potential impacts to these species and stock recruitment will be considered in the EP.

Acoustic modelling and a detailed impact assessment will be undertaken to understand the potential impacts to marine fauna and identify appropriate management measures.

FREQUENTLY ASKED QUESTIONS

Q. WILL COMMERCIAL FISHERIES BE AFFECTED?

The Active Source Area and EP Area have limited overlap with commercial fisheries. Most commercial fishing activity occurs on the continental shelf and along the continental shelf break, which lie on the periphery of the Active Source Area and EP Area. While many fishing activities will be avoided, there is still the potential for some interaction with some State-managed fish, rock lobster and giant crab fisheries, the Commonwealth Trawl Sector, and the Southern Bluefin Tuna Fishery, in the event that the seismic vessel operates near the edge of the continental shelf. TGS will consult with commercial fishing stakeholders to improve understanding of these fisheries and identify suitable measures to manage impacts.

Q. HOW WILL INTERACTIONS WITH FISHERIES BE MANAGED?

It is TGS's intention to carry out the Otway Basin 3D Multi-client MSS in a manner that does not interfere with fishing or the resources of the sea, to a greater extent than is necessary. However, it is acknowledged that there is the potential for the survey to interact with fishing activities.

TGS cannot restrict fishing access to the survey area and will consider concurrent operational planning options with commercial fishers. TGS will also provide notifications to fishers prior to the commencement of the survey as well as regular updates during survey activities. Open radio communications will also be maintained with fishing vessels.

Q. WILL TGS COMPENSATE FISHERS FOR INTERRUPTION TO THEIR FISHING ACTIVITIES?

TGS believes that commercial fishers and fishing charter boat operators should not be unfairly disadvantaged by the Otway Basin 3D Multi-client MSS .

Should fishers be genuinely impacted by the Otway Basin 3D Multi-client MSS, TGS will consider claims on a case-by-case basis.

If you would like to provide comment or request further information on the Otway Basin 3D Multi-client MSS, please contact TGS:

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

INFORMATION SHEET

Otway Basin Marine Seismic Survey

TGS is proposing to undertake a three-dimensional (3D) marine seismic survey (MSS) in the Otway Basin, in Commonwealth waters offshore of Victoria and Tasmania.

TGS is preparing an Environment Plan (EP) for the survey to provide to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment. As part of EP, we need to identify potential risks and impacts of the proposed survey and provide the measures TGS will implement to address those risk and impacts.

Why are we contacting you?

TGS is contacting you because our assessment of values and sensitivities show the survey activity and area may be important to you. TGS wish to speak with you to understand what your key sensitivities and concerns might be as a traditional custodian of the area.

Let's talk…

We would like to meet with you and your members to fully explain the proposed project and what is involved in a marine seismic survey. We want to provide you an opportunity to ask any questions or discuss any queries you may have, and this will hopefully help you determine if there is likely to be any impact to you and your community. It is very important that TGS understands any concerns you may have and help identify appropriate measures to minimise any impacts. We can set up a meeting style to accommodate your group, which may involve a small online meeting or involve a larger community townhall type meeting.

Communication commitment

TGS has a reputation for implementing high standards of environmental protection in environmentally sensitive areas to mitigate and minimise impacts on the surrounding marine environment and communities. TGS is committed to:

- working with all local communities to ensure their concerns are identified and potential risks to the environment managed before activities begin and throughout the project duration.
- maintaining regular, ongoing communication with interested parties throughout the duration of the survey and work with communities in a transparent manner.

Please be aware that all communications will be logged, assessed and acknowledged with a response from TGS. In accordance with regulatory requirements, full copies of all correspondence will be provided to NOPSEMA within the EP. However, any information determined to be sensitive will not be made public. Please inform TGS if any information provided is confidential and not to be made available to the public.

Once submitted, NOPSEMA will publish the EP on the NOPSEMA website for a 30-day public comment period. TGS will provide all interested parties with a notification of the commencement of the public comment period.

However, we can't do it without you as we don't know what we don't know! Here is some basic information about marine surveys and our proposal to get started…

What is a Marine Seismic Survey?

Marine seismic surveying is used to understand the geological (rock and soil) layers beneath the sea floor. A survey vessel tows an acoustic source and multiple cables, also known as streamers (**Figure 1**) under the surface of the water. The acoustic source releases a pulse of sound energy (sound waves) into the water column directed downwards. The sound waves pass through the different rock layers and bounce back towards the surface. The streamers receive the sound waves that are reflected back and from these reflections a picture of the rock layer geology is produced across the survey area.

The streamers can be up to 9 km long and are towed with a tail buoy, radar reflectors and lights for easy identification. The seismic vessel moves within a specific survey area (see below) along a series of lines at a speed of approximately 7.5 – 9.5 km/hr. The level of sound energy is adjusted prior to commencement, slowly ramped up to warn any nearby marine mammals, fish or other fauna to move away. This occurs with continuous monitoring and advice from the marine fauna observers onboard the survey vessel and in support vessels accompanying the survey vessel.

Support vessels work with the seismic vessel to communicate with other vessels that have entered the survey area and to assist with overall operations, such as providing food and supplies.

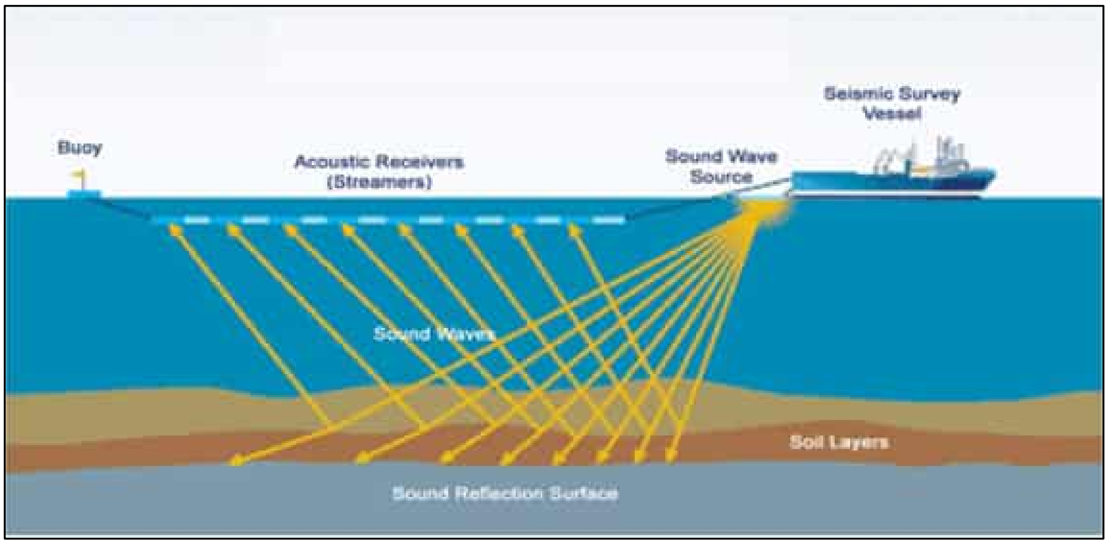


Figure 1 – Schematic illustrating a typical marine seismic survey

Survey Area

There are two key areas within the seismic survey area (**Figure 2** over the page):

- An *operational area* (OA) – the largest area where all survey activities must take place within, e.g. maintenance, refuelling, vessel manoeuvring and streamer deployment; and
- An *acquisition area* (AA) – smaller area within the OA where seismic data is acquired. This is the only area where the active source (sound wave generator) can be used at full power.

Within the AA, the seismic vessel travels back and forth along parallel sail lines in a “race track” pattern, whereby the vessel turns at the end of each sail line and returns in the opposite direction along a different sail line. Water depths within the AA range between approximately 510 m and 5,650 m which means the survey avoids the shallower continental shelf area.

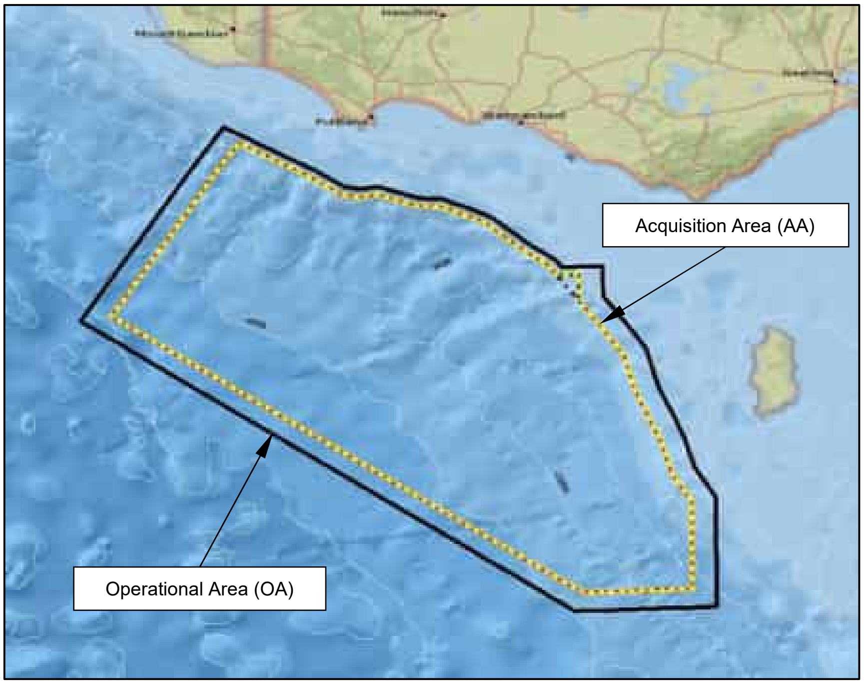


Figure 2 – Location of the proposed marine seismic survey and the two defined areas: Operational Area (OA) and Acquisition Area (AA)

Flora and Fauna Sensitivities

TGS has undertaken a thorough analysis of marine flora and fauna sensitivities in the Operational Area through the development of the EP, enabling TGS to identify and incorporate control measures to account for these sensitivities and minimize potential environmental risks. Multiple whale species (Blue, Southern Right, Sei and Fin) in particular, have been identified in the early analysis as being some of the key sensitivities in the area. The EP has focused on these species and introduced additional control measures to minimise disturbance as a result of the proposed seismic activities.

There will be two dedicated Marine Mammal Observers (MMOs) onboard the survey vessel who will visually monitor precaution zones and observation zones, during daylight hours in accordance with the Environment Protection and Biodiversity Conservation Act. There will also be Passive Acoustic Monitoring (PAM) operating 24 hours a day to detect any marine mammals in the vicinity of the survey vessel. Mitigation measures such as restricting survey operations in certain areas at certain times of peak mammal activity, extended shut down zones, soft start procedures and adaptive management procedures (such as relocation should more whales be detected in an area than is expected) will be implemented to minimize any potential for disturbance to whales during the survey.

Fuel Spill Mitigation and Response

As part of the environmental planning and approval process, TGS has conducted a modeling study to identify the area of potential impact from an accidental fuel spill from the seismic vessel fuel tank. This helps TGS identify measures for:

- preventing a spill occurring;
- planning how best to respond to an incident to minimise the impact of a spill occurring; and
- identifying whom to notify should a spill occur.

It is important to note, the modelling is highly conservative and provides the maximum potential area for a spill to reach resulting from a collision with another vessel, using multiple spill locations within the OA. This type of event has a very low likelihood of occurring and has never occurred within Australian waters. However, TGS use the fuel dispersal model to identify the environment that may be affected (EMBA) (Figure 3) and guide whom they may need to consult about the proposed survey.

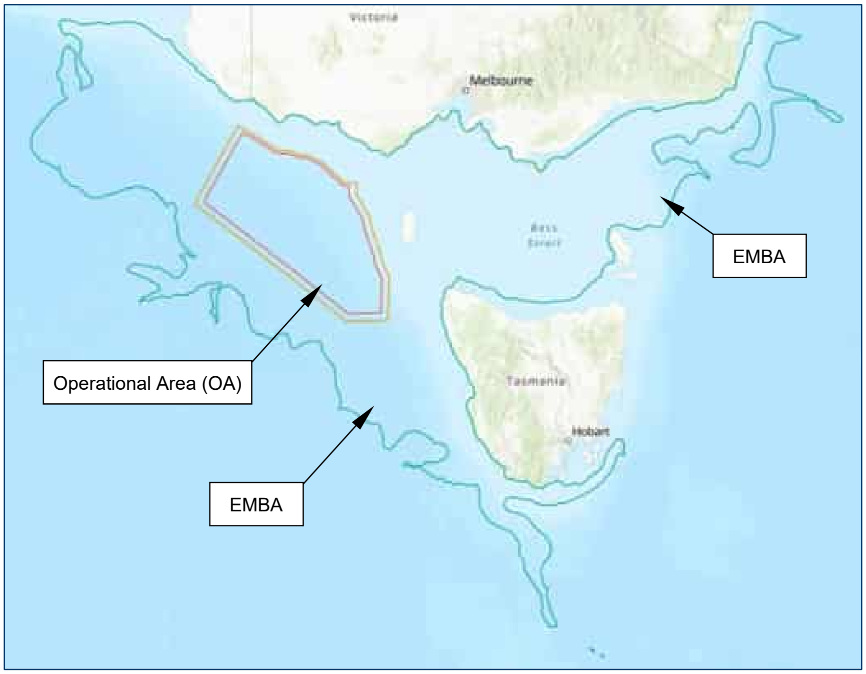


Figure 3 – Accidental fuel dispersion modelling showing environment that may be affected (EMBA)

Modern seismic vessels mitigate the risk of fuel spills via physical design features such as double hull configuration and having multiple compartmentalized fuel tanks of reduced size instead of one large fuel tank. The vessel that will be contracted for this project will have these features and will have worked in Australian waters previously.

The seismic vessel provider has safety procedures in place and documented actions to take if an incident were to occur. As a subcontractor of TGS, the vessel provider also has to comply with TGS' rigorous QHSE standards and commitments made within the Environment Plan which forms part of the regulatory approval process. At least one support vessel will work alongside the seismic vessel during the survey.

Concerned parties should note that the EP also provides an Oil Pollution Emergency Plan (OPEP) which is a legal requirement for all seismic vessels of a certain size to develop and implement. The OPEP provides detailed measures and procedures for preventing and responding to a seismic vessel fuel oil spill.

Tell us what is important to you

TGS values your feedback to help identify and address any of your concerns so please share them with us. We want to know about your spiritual, physical and cultural connections with the land and sea country so we can understand how best to respect and provide for them.

Please get in touch so we can arrange a meeting that suits you and your group and let us know if you need any information in the meantime.

TGS would like to acknowledge the Traditional Custodians of the land and sea country in which the Otway Marine Seismic Survey will be carried out. We recognise their continuing connection to the land, waters and culture. We pay our respects to their Elders past, present and emerging.

If you would like to provide comment or request further information on the Otway Basin Marine Seismic Survey, please contact TGS:

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

INFORMATION SHEET

Otway Basin 3D Multi-client Marine Seismic Survey

Otway@tgs.com
+61 (08) 9480 0000
Level 9, 220 St Georges Tce
Perth, WA 6000

TGS

TGS is proposing to undertake a three-dimensional (3D) multi-client marine seismic survey (MSS) in the Otway Basin, in Commonwealth waters offshore of Victoria and Tasmania.

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, TGS are preparing an Environment Plan (EP) for the survey for assessment by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

TGS welcomes your feedback on the proposed survey activity

PROPOSED ACTIVITY

Marine seismic surveying is used to improve the understanding of subsurface geology in marine environments. During marine seismic surveys, seismic data is acquired using a purpose-built seismic survey vessel towing an acoustic source and multiple cables of hydrophones, also known as streamers. Streamers are towed with a tail buoy, radar reflectors and lights to mark the end of the array. The streamers will be up to 9 km long to adequately record the necessary information. Both the source and streamers are towed beneath the surface of the water (**Figure 1**). Acoustic energy from the acoustic source is detected by the streamers and recorded on board the vessel. The recorded signals are then processed to provide information about geological formations below the seabed.

When recording the data, the seismic vessel traverses the survey area along a series of pre-determined sail lines at a speed of approximately 4 – 5 knots (7.5 – 9.5 km/hr). The level of acoustic emissions can be adjusted to provide low-power ‘soft start’ or ‘fauna alert’ procedures, at any point during the survey or maintenance operations.

Support vessels will work with the seismic vessel to assist in communicating with other vessels that have entered the area of operations and to support the overall operations, such as providing food and supplies.

Table 1 on the following page provides a summary of the Otway Basin 3D Multi-client MSS.

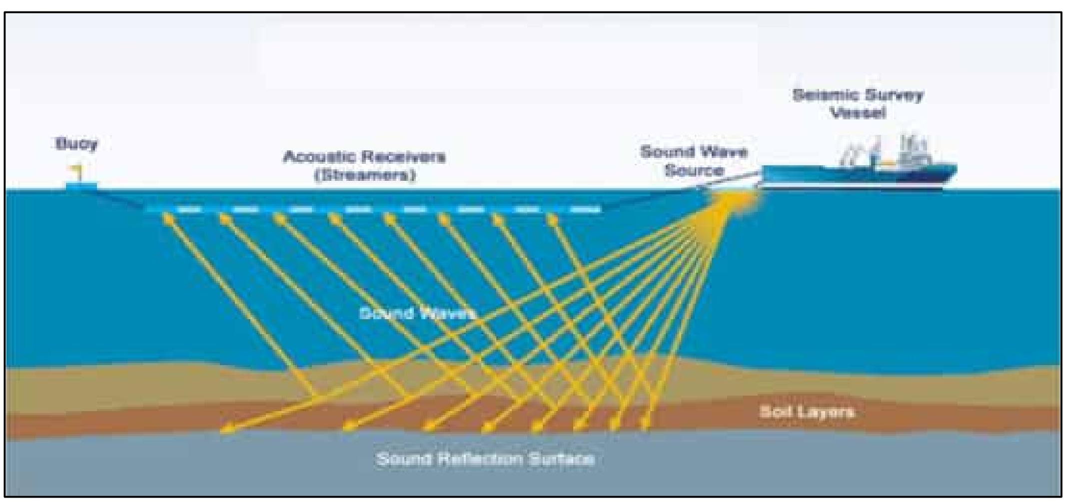


Figure 1 – Schematic illustrating a typical marine seismic survey

SURVEY AREAS

The proposed Otway Basin 3D Multi-client MSS comprises the following areas (**Figure 2**):

- An *operational area* (OA) – the largest area where all survey activities must take place within, e.g. maintenance, refuelling, vessel manoeuvring and streamer deployment; and
- An *acquisition area* (AA) – smaller area within the OA where seismic data is acquired. This is the only area where the active source can be used at full power.

The AA includes areas where prospective clients may be interested in acquiring seismic data in the foreseeable future. It includes the space where data acquisition may occur, plus additional space for the survey vessel to "run-in" to or "run-out" of sail lines while the acoustic source is active.

During 3D seismic data acquisition, the seismic vessel travels back and forth along pre-determined parallel sail lines which are acquired in a "race track" pattern within the AA, where the vessel turns at the end of each sail line and returns in the opposite direction along a different sail line. Sail lines will be orientated approximately parallel with the seabed contours (approximately north-west/south-east).

The AA includes water depths between approximately 510 m and 5,650 m, therefore, the acoustic source will not be operated in shallower continental shelf waters during 3D seismic data acquisition.

In addition, up to five single 2D lines may be acquired to "tie-in" to existing geophysical data in the region. The 2D tie-in lines will be acquired approximately perpendicular to the seabed contours (approximately south-west/north-east). Each tie-in line will be up to a maximum of 150 km in length (less than a day of acquisition time). The tie-in lines will overlap with 3D data acquisition in the AA; however, one of the 2D tie-in lines may need to extend onto the continental shelf. Consequently, a '2D Tie-line Active Source Area Extension' is included in addition to the AA (also included within Figure 2). Operation of the acoustic source in the 2D Tie-line Active Source Area Extension will be limited only to a single 2D tie-in line. At the shallowest point, this 2D Tie-line Active Source Area Extension is approximately 115 m.

The broader OA includes space required for vessel turns and other vessel operations that may be required beyond the extent of the AA. It includes waters depths from approximately 95 m to 5,650 m.

Table 1 – Otway Basin 3D Multi-client MSS Summary

Earliest commencement	1 October 2023 (pending regulatory approvals, environmental sensitivities and vessel availability).	
Estimated completion	Pending acceptance by NOPSEMA, the EP will be valid until 30 September 2027.	
Estimated survey duration	Total acquisition is 400 days over 5 year period, however maximum of 200 days per year. Allows flexibility to accommodate adverse weather, equipment maintenance etc.	
Water depth	Predominantly 510 m to 5,650 m, reducing to approximately 115 m for a single 2D tie-line within the Active Source Area Extension (see Figure 2).	
Vessels	One purpose-built seismic survey vessel, plus additional support vessels. Vessel details have not yet been confirmed.	
Acoustic array	Acoustic source 3,500 in^3 with maximum of 14 streamers up to 9 km length.	
Survey vessel speed	Approximately 4 – 5 knots (7.5 – 9.5 km/hour).	
Dimensions of towed equipment	Approximately 8 – 10 km length and approximately 800 m – 1.6 km wide.	
Area of avoidance	3 nautical miles requested around the survey vessel and streamers.	
Proximity to key locations	**Location**	**Approximate Distance to OA**
	Portland (VIC)	48 km
	Warrnambool (VIC)	61 km
	Arthur River (TAS)	85 km
	King Island (TAS)	39 km
	Robe (SA)	64 km

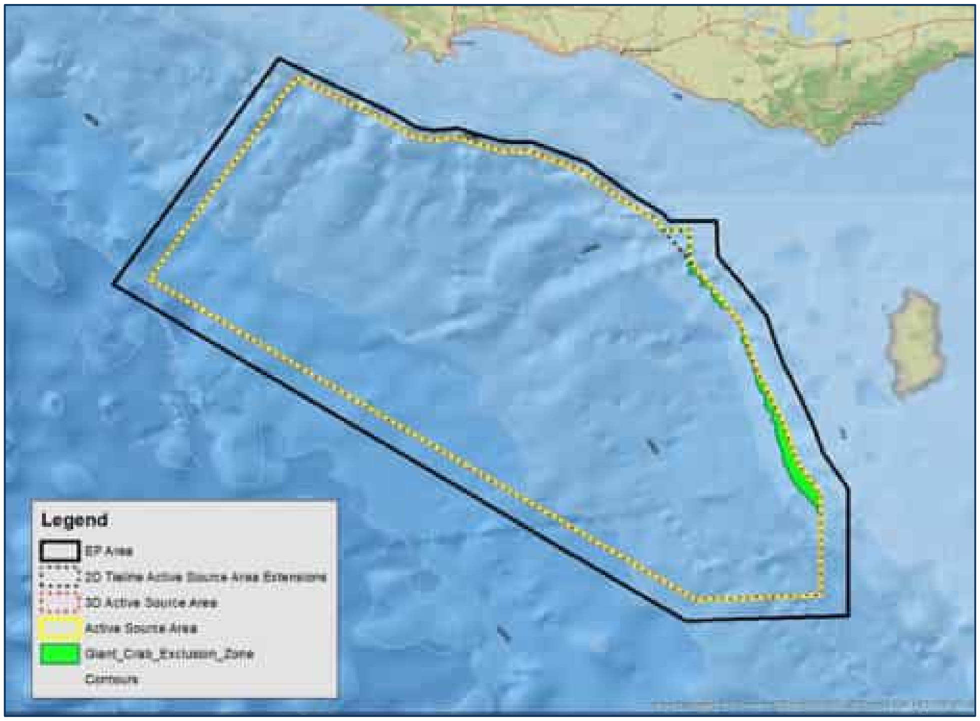


Figure 2 – Location of the proposed Otway Basin 3D Multi-client MSS

ENVIRONMENTAL PERFORMANCE

TGS has a reputation for implementing high standards of environmental protection in environmentally sensitive areas to mitigate and minimise impacts on the surrounding marine environment and stakeholders. TGS is committed to working with all interested parties to ensure concerns and risks are identified and reduced to as low as reasonably practicable before activities begin and throughout the project duration.

A summary of key environmental management measures associated with the Otway Basin 3D Multi-client MSS are summarised below. These management measures will be implemented as a minimum. Additional management measures may also be identified during relevant person engagement and development of the EP.

FLORA AND FAUNA SENSITIVITIES

TGS has undertaken a thorough analysis of marine flora and fauna sensitivities in the Operational Area through the development of the EP, enabling TGS to identify and incorporate control measures to account for these sensitivities and minimize potential environmental risks. Multiple whale species (Blue, Southern Right, Sei and Fin) in particular, have been identified in the early analysis as being some of the key sensitivities in the area. The EP has focused on these species and introduced additional control measures to minimise disturbance as a result of the proposed seismic activities.

There will be two dedicated Marine Mammal Observers (MMOs) onboard the survey vessel who will visually monitor precaution zones and observation zones, during daylight hours in accordance with the Environment Protection and Biodiversity Conservation Act. There will also be Passive Acoustic Monitoring (PAM) operating 24 hours a day to detect any marine mammals in the vicinity of the survey vessel. Mitigation measures such as restricting survey operations in certain areas at certain times of peak mammal activity, extended shut down zones, soft start procedures and adaptive management procedures (such as relocation should more whales be detected in an area than is expected) will be implemented to minimize any potential for disturbance to whales during the survey.

FUEL SPILL MITIGATION AND RESPONSE

As part of the environmental planning and approval process, TGS has conducted a modeling study to identify the area of potential impact from an accidental fuel spill from the seismic vessel fuel tank. This helps TGS identify measures for:

- preventing a spill occurring;
- planning how best to respond to an incident to minimise the impact of a spill occurring; and
- identifying whom to notify should a spill occur.

It is important to note, the modelling is highly conservative and provides the maximum potential area for a spill to reach resulting from a collision with another vessel, using multiple spill locations within the OA. This type of event has a very low likelihood of occurring and has never occurred within Australian waters. However, TGS use the fuel dispersal model to identify the environment that may be affected (EMBA) (**Figure 3**) and guide whom they may need to consult about the proposed survey.

Modern seismic vessels mitigate the risk of fuel spills via physical design features such as double hull configuration and having multiple compartmentalized fuel tanks of reduced size instead of one large fuel tank. The vessel that will be contracted for this project will have these features and will have worked in Australian waters previously.

The seismic vessel provider has safety procedures in place and documented actions to take if an incident were to occur. As a subcontractor of TGS, the vessel provider also has to comply with TGS' rigorous QHSE standards and commitments made within the Environment Plan which forms part of the regulatory approval process. At least one support vessel will work alongside the seismic vessel during the survey.

Concerned parties should note that the EP also provides an Oil Pollution Emergency Plan (OPEP) which is a legal requirement for all seismic vessels of a certain size to develop and implement. The OPEP provides detailed measures and procedures for preventing and responding to a seismic vessel fuel oil spill.

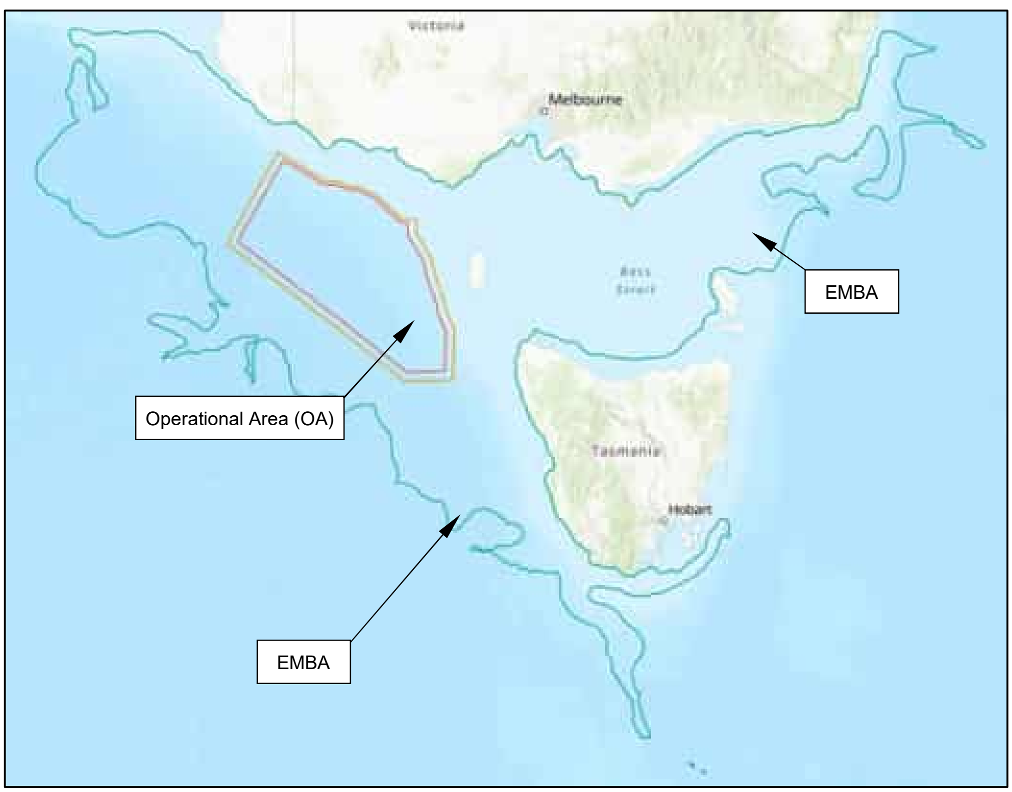


Figure 3 – Accidental fuel dispersion modelling showing environment that may be affected (EMBA)

KEY CONTROL MEASURES

INTERACTIONS WITH FISHERIES

- Seismic data acquisition in water depths less than 500 m will be limited to a single 2D tie-in line to minimise interaction with most fisheries.
- Fisheries relevant persons will be notified four weeks prior to commencement of the survey, providing the location and expected timing.
- Daily look-ahead reports, detailing upcoming survey activities within the next 48 hours, will be emailed to fisheries relevant persons who register for this service.
- Fisheries relevant persons will be notified upon completion of the survey.

UNDERWATER NOISE

- TGS will implement precaution zones, pre-start observations and soft-start, low-power and shut-down procedures in accordance with EPBC Policy Statement 2.1 – Interaction with whales.
- Marine fauna observers will be present on the survey vessel throughout the survey duration.
- Operation of the seismic source in water depths < 500 m will be limited to a few hours for a single 2D tie-in line.
- Subject to the outcomes of acoustic modelling and further assessment, additional control measures and adaptive management procedures will be considered.

INTERACTIONS WITH MARINE FAUNA

- Vessels will not exceed a speed of 6 knots or actively approach within the caution zone of a cetacean in accordance with EPBC Regulations 2000 - Part 8 Division 8.1.
- Strict caution zones and speed restrictions also apply for marine turtles.
- Tail buoys on streamers will be designed to reduce the risk of entrapment.

INTERACTION WITH OTHER MARINE USERS

- Notice to Mariners and notification to the AMSA Joint Rescue Coordination centre (JRCC) will be issued prior to survey commencement.
- Vessels will maintain appropriate lighting, signals, navigation and communication at all times, in compliance with the *Navigation Act 2012* and associated Marine Orders.
- Tail buoys on streamers will be fitted with lights and radar reflectors.
- At least one support vessel will accompany the survey vessel during seismic operations.

VESSEL MANAGEMENT

- Vessel emissions, discharges and waste management will comply with the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL), the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and associated Marine Orders.
- Vessels will manage ballast water in accordance with the Australian Ballast Water Management Requirements and the *Biosecurity Act 2015.*
- TGS will implement an Oil Pollution Emergency Plan (OPEP) for the duration of the survey.
- All vessels will have Shipboard Oil Pollution Emergency Plans (SOPEPs).

FURTHER CONSULTATION

WE WANT TO HEAR FROM YOU

We are contacting you because our assessment of values and sensitivities show there may be overlap with areas that are important to you. Therefore, we would like to understand the following:

- Do you have any functions, interests or activities that may be affected by the proposed activities to be carried out under the Environment Plan?
- Do you want to meet with TGS, either in person or via video conference to discuss the proposed activities to be carried out under the Environment Plan?

OUR COMMITMENT

- TGS is committed to maintaining regular communication with all relevant persons throughout the duration of the survey and works with communities in a transparent manner. This will be supported with the supply of 48-hour operational detail lookahead plans which will be distributed every 24 hours, with notification being provided to relevant persons during operations.
- If you wish to receive these notifications or specific information regarding this survey, please advise as soon as possible.

YOUR FEEDBACK

TGS is seeking your feedback regarding this proposed activity before making a formal EP submission to NOPSEMA. If you would like to comment on the survey, request additional information, or meet with us to discuss the survey, please contact us as soon as possible.

All communications will be logged, assessed and acknowledged with a response, and incorporated into the EP. In accordance with regulatory requirements, full copies of correspondence with relevant persons will be provided to NOPSEMA. However, this information and any other information determined to be sensitive will not be made public. Relevant persons are advised to inform TGS if any information provided is confidential and not to be published in the EP.

In addition, once the EP is submitted to NOPSEMA, it will be published on the NOPSEMA website for a 30-day public comment period. TGS will provide relevant persons with a notification of the commencement of the public comment period.

TGS would like to acknowledge the Traditional Custodians of the land and sea country in which the Otway Marine Seismic Survey will be carried out. We recognise their continuing connection to the land, waters and culture. We pay our respects to their Elders past, present and emerging.

If you would like to provide comment or request further information on the Otway Basin 3D Multi-client MSS, please contact TGS:

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

FREQUENTLY ASKED QUESTIONS

Q. WHAT IS A 'MULTI-CLIENT' SEISMIC SURVEY?

Seismic surveys are conducted on either a multi-client or proprietary basis. Proprietary surveys are acquired for an individual petroleum titleholder, and the coverage of the survey is usually limited to the titleholder's petroleum permit area. In contrast, multi-client surveys are acquired by a geophysical survey company and are generally collected over larger areas where there may be future interest in oil and gas prospects.

Geophysical companies (in this case, TGS) collect the data which is then licensed to multiple clients (i.e. multiple titleholders). Although multi-client surveys may cover large areas, a key advantage of a multi-client seismic survey is that the data may be acquired by a single seismic survey, and so fewer seismic surveys are likely to be required in the region.

Q. WILL THE SEISMIC SURVEY OCCUR OVER THE ENTIRE EP AREA?

The defined Acquisition Area (AA) and Operational Area (OA) represent the maximum area where TGS will apply for permission to acquire the Otway Basin 3D Multi-client MSS. The actual survey area that will be surveyed will depend on the level and areas of interest received from petroleum titleholders in the region, and if TGS are engaged to acquire seismic data on their behalf. Therefore, there may be areas within the OA that are never surveyed, but the EP and relevant person consultation consider the maximum area for the purposes of environmental management.

When specific survey areas are confirmed, the areas and proposed commencement dates will be communicated to relevant persons.

Q. WHAT HAS TGS DONE TO AVOID ENVIRONMENTALLY SENSITIVE AREAS?

TGS has made a conscious effort to limit survey overlap with the continental shelf and shallow nearshore waters. The 3D AA does not extend into waters shallower than 510 m; only one 2D tie-in line will require the use of the acoustic source in shallower waters. The decision was made to limit activities to deeper, offshore waters in order to reduce the potential effects on marine fauna and commercial fisheries in nearshore waters.

Q. WHAT MARINE FAUNA MIGHT BE AFFECTED?

A number of whale and dolphin species occur in the region. These include pygmy blue whales, which are typically present in the region to forage during the summer and autumn. The presence of the Bonney Upwelling provides nutrient rich waters, and the continental shelf is known as a biologically important area for the foraging by this species. The AA has been designed to minimise overlap with these foraging areas.

Coastal and continental shelf waters also support species such as southern right whales, fur seals, sea lions and little penguins. However, given that the AA is limited to waters greater than 510 m water depth, limited disturbance to these species and their habitats in nearshore waters is expected.

Various fish and shellfish species may also be present in the survey area, including commercially significant fish species, rock lobster and giant crab. Potential impacts to these species and stock recruitment will be considered in the EP.

Acoustic modelling and a detailed impact assessment will be undertaken to understand the potential impacts to marine fauna and identify appropriate management measures.

FREQUENTLY ASKED QUESTIONS

Q. WILL COMMERCIAL FISHERIES BE AFFECTED?

The OA and AA have limited overlap with commercial fisheries. Most commercial fishing activity occurs on the continental shelf and along the continental shelf break, which lie on the periphery of the AA and OA. While many fishing activities will be avoided, there is still the potential for some interaction with some State-managed fish, rock lobster and giant crab fisheries, the Commonwealth Trawl Sector, and the Southern Bluefin Tuna Fishery, in the event that the seismic vessel operates near the edge of the continental shelf. TGS will consult with commercial fishing groups to improve understanding of these fisheries and identify suitable measures to manage impacts.

Q. HOW WILL INTERACTIONS WITH FISHERIES BE MANAGED?

It is TGS's intention to carry out the Otway Basin 3D Multi-client MSS in a manner that does not interfere with fishing or the resources of the sea, to a greater extent than is necessary.

However, it is acknowledged that there is the potential for the survey to interact with fishing activities.

TGS cannot restrict fishing access to the survey area and will consider concurrent operational planning options with commercial fishers. TGS will also provide notifications to fishers prior to the commencement of the survey as well as regular updates during survey activities. Open radio communications will also be maintained with fishing vessels.

Q. WILL TGS COMPENSATE FISHERS FOR INTERRUPTION TO THEIR FISHING ACTIVITIES?

TGS believes that commercial fishers and fishing charter boat operators should not be unfairly disadvantaged by the Otway Basin 3D Multi-client MSS .

Should fishers be genuinely impacted by the Otway Basin 3D Multi-client MSS, TGS will consider claims on a case-by-case basis.

If you would like to provide comment or request further information on the Otway Basin 3D Multi-client MSS, please contact TGS:

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

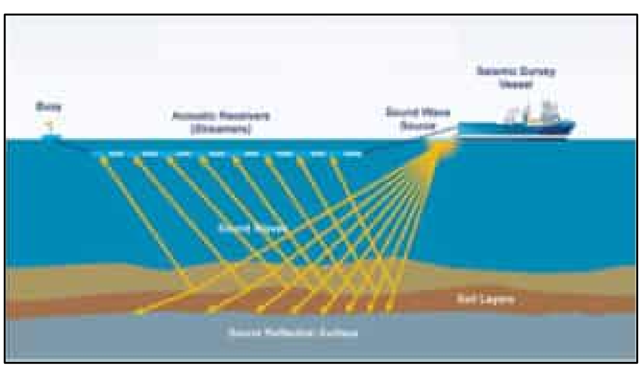
TGS Otway Basin 3D Marine Seismic Survey

TGS is proposing to undertake a three-dimensional (3D) marine seismic survey (MSS) in the Otway Basin, in Commonwealth waters offshore of Victoria and Tasmania commencing October 2023.

Approximate distance to survey area	
Portland (VIC)	48 km
Warrnambool (VIC)	61 km
Arthur River (TAS)	85 km
King Island (TAS)	39 km
Robe (SA)	64 km

What is marine seismic surveying?

Marine seismic surveying is used to improve the understanding of marine subsurface geology. A purpose-built seismic survey vessel tows an acoustic source and multiple cables of hydrophones (streamers) positioned beneath the surface of the water (*image below*). Acoustic energy is discharged from the acoustic source which is then detected by the streamers and recorded on board the vessel. The recorded signals are then processed to provide data about geological formations below the seabed.



Summary of survey details	
Estimated survey duration	Total acquisition is 400 days over 5 year period, with maximum of 200 days per year.
Water depth	Predominantly 510 m to 5,650 m, reducing to approximately 115 m for a single 2D tie-line.
Vessels	One purpose-built seismic survey vessel, plus additional support vessels.
Acoustic array	Acoustic source 3,500 in^3 with maximum of 14 streamers.
Survey vessel speed	Approximately 4 – 5 knots (7.5 – 9.5 km/hour).
Dimensions of towed equipment	Approximately 8 – 10 km length and 800 m – 1.6 km wide.
Area of avoidance	3 nautical miles around the survey vessel and streamers.

Why we need to hear from you

We are currently working through the preliminary phase of our consultation process. This involves identifying all relevant persons that could have functions, interests or activities potentially impacted by the proposed survey. Typically this was based on proximity to the survey operational area but now must consider a wider environment that may be affected, for example from an unplanned fuel spill.

Then, we need to ensure our relevant persons have sufficient information to understand what is proposed so they can determine if and how, the survey may impact them. Our approach varies depending on the group and may require a meeting to explain the process and provide the opportunity to discuss any queries or concerns, or may simply require an information sheet detailing the high-level specifics of the survey.

Your input matters

The information we receive from consultation assists with planning our survey to ensure we are aware of and consider our relevant person's values and sensitivities. This information is incorporated within our extensive assessment of potential impacts to all existing environmental values and sensitivities (physical, biological, socio-economic, cultural etc) within and around the survey area.

TGS would like to acknowledge the Traditional Custodians of the land and sea country in which the Otway Marine Seismic Survey will be carried out. We recognise their continuing connection to the land, waters and culture. We pay our respects to their Elders past, present and emerging.

Determining control measures

TGS then identifies key control measures that will be implemented to avoid, mitigate or minimise those impacts to as low as reasonably practicable. Some examples of control measures include:

- Acquisition exclusion zones to protect important foraging or fishing areas (*see images to the right*).
- Acoustic source shutdown triggers for important fauna species.
- Underwater passive acoustic monitoring to detect any nearby marine mammals.
- Daily 48 hour lookahead reports distributed to other marine users.
- Extensive compliance monitoring to ensure procedures and policies are being implemented.

In addition to extensive literature reviews and research, this phase involves substantial engagement with our relevant persons, including technical experts and subject matter specialists.

Once the control measures have been finalised, TGS details their information within an Environmental Plan (EP).

Giant crab fishery exclusion zone

Pygmy Blue Whale foraging area with buffer

NOPSEMA – public consultation and EP approval

Once the EP has been drafted, TGS will submit their EP to NOPSEMA to determine if it meets all of the regulatory requirements. Once NOPSEMA accepts the EP as complete, the EP will be available for public review for a period of 30 days. Any person or group is welcome to make a submission on the EP content at that stage.

When the public consultation period closes, TGS reviews and assesses all relevant submissions. New information is incorporated in to the survey planning and EP as required, before TGS re-submits the EP to NOPSEMA. NOPSEMA will then commence their assessment for EP approval, which may require further information from TGS. If NOPSEMA is satisfied with the EP, the EP will be approved and the proposed activity can commence in accordance with the approved EP.

Right now, we need to know:

- Do you have any functions, interests or activities that may be affected by the proposed marine seismic survey?
- Do you need further information from TGS to understand more about the proposed survey?

If you would like to meet with us to discuss the proposed survey further or raise any concerns you have please get in touch with me directly via the contact details below. We look forward to meeting with you.

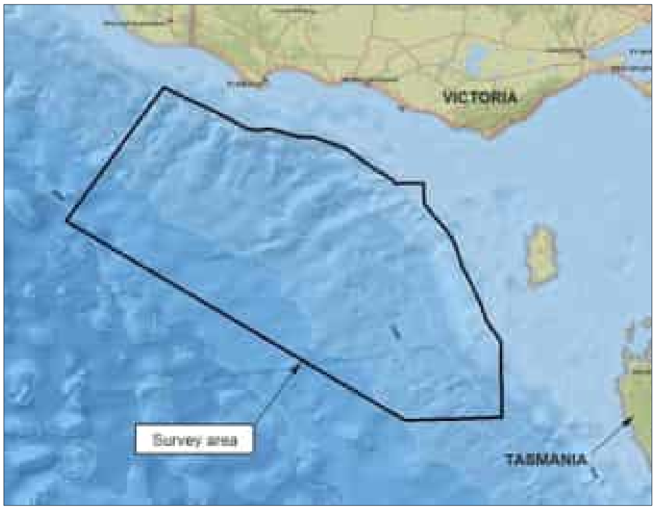
Tanya Johnstone

Email: Otway@tgs.com
Phone: +61 (08) 9480 0000
Post: Level 9, 220 St Georges Terrace,
Perth, WA 6000
Australia

TGS

TGS Marine Seismic Survey – Otway Basin

TGS welcomes you to a community information session regarding their marine seismic survey located in Commonwealth waters offshore of Victoria and Tasmania commencing October 2023. TGS will provide an overview of the proposed survey followed by an opportunity to discuss any queries or concerns.



Please join us:

Date: Tuesday 30 May 2023

Time: 3 pm

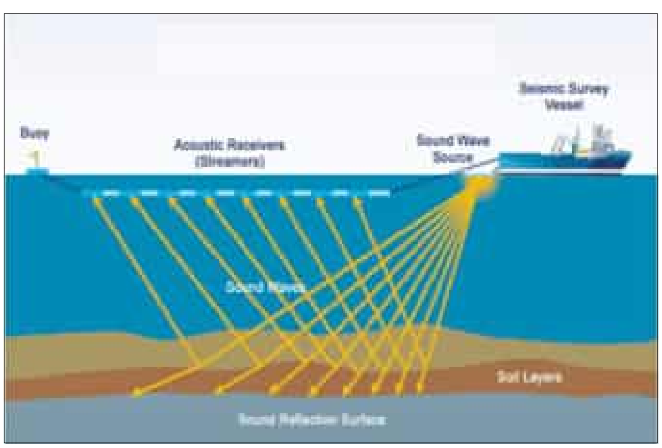
Location: BLALC Community Hub

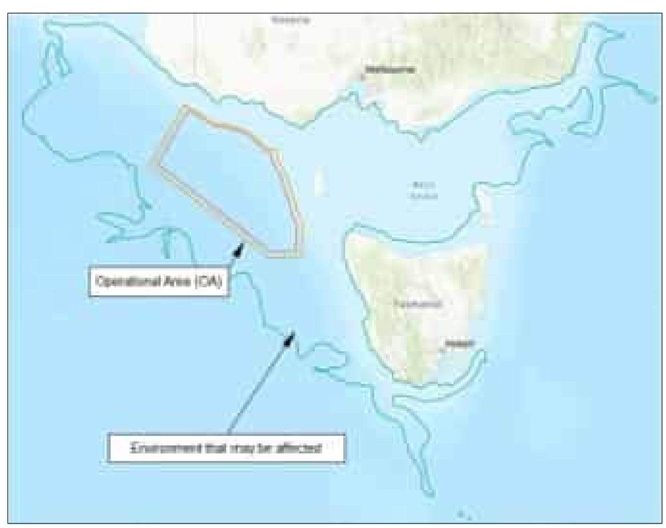
What is marine seismic surveying?

Marine seismic surveying is used to understand the geological (rock and soil) layers beneath the sea floor. A survey vessel tows an acoustic source and multiple cables, also known as streamers under the surface of the water. The acoustic source releases a pulse of sound energy (sound waves) into the water column directed downwards. The sound waves pass through the different rock layers and bounce back towards the surface. The streamers receive the sound waves that are reflected back and from these reflections a picture of the rock layer geology is produced across the survey area.

But it's so far away – is it relevant?

TGS is required to contact persons and organisations that may be impacted by the project's worst-case scenario of an unplanned activity. For this project that is likely to be a release of the survey vessel's fuel from a collision within the survey area. TGS has carried out modelling to identify the environment that may be affected by a release (below). With tides, currents and wind, a fuel release could travel further than the survey area to the southern coast of NSW. **PLEASE NOTE**: the modelling is very conservative and the actual likelihood of a collision occurring and travelling that far is very low, however TGS use this information to guide their consultation.





TGS would like to acknowledge the Traditional Custodians of the land and sea country in which the Otway Marine Seismic Survey and consultation is being carried out. We recognise their continuing connection to the land, waters and culture. We pay our respects to their Elders past, present and emerging.

Marine Seismic Survey – Otway Basin please contact Tanya TGS: **Email:** Otway@tgs.com • **Phone:** +61 (08) 9480 0000 •

blic-notices/

ASSIFIEDS

THE STANDARD

Warrnambool Bowls
133rd
Annual General Meeting
will be held
Wednesday 28th June 2023 at 7.00pm
at the Warrnambool Bowls Club
75 Timor Street Warrnambool

22/05/2023 - public notices

Francis Foundation

Warrnambool
A registered charity and not-for profit organisation supporting individuals with mental health issues at risk of homelessness for over 40 years are seeking a
Co-ordinator
Maximum 20 hours per week
Closing Date 2 nd June 2023

Contact for information:
francisfoundation@outlook.com

20/05/2023 - public notices

TGS

TGS OTWAY BASIN MARINE SEISMIC SURVEY - COMMUNITY INFORMATION SESSION

TGS welcomes you to a community information session regarding their proposed marine seismic survey within the Otway Basin. TGS would like to understand how their proposed survey may impact the local community. This information will assist TGS with their survey planning and development of their environmental plan. TGS will provide an overview of the proposed survey followed by an opportunity to discuss any queries or concerns.

Please join us on 29th May between 6:00 – 7:00 pm at the BIG4 Port Fairy Function Venue, 115 Princes Highway, Port Fairy.

20/05/2023 - public notices

Not To Be Missed

The film 'Sonic Sea' will be screened at the lecture hall, Port Fairy on Saturday 27th May at 6pm

The film will also be screened at the Capital

Noticeboard
May 20, 2023

Works and road closures

Clearing sale - South West Victoria Livestock Exchange

20/05/2023 - public notices

Moyne Shire Council
Community Update

Ordinary Council Meeting
Will be held at the Council Offices, Jamieson Avenue, Mortlake on 23 May 2023 from 2pm. A link to the meeting will be on Council's Facebook page and website. The public participation section of the meeting is held at the beginning of the meeting. Any person wishing to address the Council during public participation must submit details of the nature of the issue/question they wish to raise, in writing by 12 noon 22 April 2023.

Public EV charging point - Port Fairy
Evie Networks is proposing to install a public access electric vehicle charging point in Port Fairy. Under an agreement, Council will provide suitable land and Evie Networks will install and maintain the charging point.
A preferred site has been chosen in Bank Street, near Fisherman's Walk. The community is now invited to have their say on the preferred location. Visit www.moyne.vic.gov.au/your-say and fill in the online survey.

Port Fairy Norfolk Island Pine leaf/branchlet litter collection
The next collection will take place on the week commencing Monday 5th June 2023 - Friday 9th June 2023.
Please pile all branchlets that you would like collected on the nature-strip in the week leading up to this.

www.moyne.vic.gov.au @moyneshirecouncil
Phone: 1300 656 564 • Email: moyne@moyne.vic.gov.au

20/05/2023 - public notices

Noticeboard

Have your say: Environment and Sustainability Strategy

QUARTERLY GENERAL MEETING
For all members will be held upstairs at Flying Horse Bar & Brewery
Wednesday May 31, 2023 at 7.30pm
Please submit any agenda items in writing by Friday May 26 to
manager@premierspeedway.com.au

17/05/2023 - public notices

WARRNAMBOOL RACING CLUB INC

Road Closure
Friday 19 May
7:00am – 2:00pm
Tozer Road and Moore Street
Contact 03 5562 2211 or
www.warrnamboolracing.com.au.
For more information.

17/05/2023 - public notices

View Website

ENVIRONMENT PLAN NOTICE

17/05/2023 - public notices

THE STANDARD

Not To Be Missed

The film 'Sonic Sea' will be screened at the lecture hall, Port Fairy on Saturday 27th May at 6pm

The film will also be screened at the Capital Theatre on Thursday 8th June at 7pm

Tickets $10 donation per person

27/05/2023 - public notices

TGS

TGS OTWAY BASIN MARINE SEISMIC SURVEY - COMMUNITY INFORMATION SESSION

TGS welcomes you to a community information session regarding their proposed marine seismic survey within the Otway Basin. TGS would like to understand how their proposed survey may impact the local community. This information will assist TGS with their survey planning and development of their environmental plan. TGS will provide an overview of the proposed survey followed by an opportunity to discuss any queries or concerns.

Please join us on Monday 29th May between 6:00 – 7:00 pm at the BIG4 Port Fairy Function Venue, 115 Princes Highway, Port Fairy.

27/05/2023 - public notices

Noticeboard

May 27, 2023

Meetings

Scheduled Council Meeting

The meeting will be livestreamed on Council's website at www.warrnambool.vic.gov.au/council-meetings

Anyone wishing to participate in Public Question Time is asked to submit their question online www.warrnambool.vic.gov.au/council-meeting-procedures before 4pm Monday 5 June 2023.

Tenders

Bushfield-Woodford Strategic Framework Plan

Register No. 2023036

Submissions are invited for suitably qualified and experienced contractors in relation to the design and construction of the Beach Access WCC 123 Ramp & Stairs. Enquiries directed to Brady Hall on 03 5559 4833. Submissions close **2pm Friday 23 June 2023**

Specification documents available online at https://eprocure.com.au/warrnambool. All submissions must be lodged electronically via eProcure only.

Have your say

South Warrnambool Flood Investigation

Community Drop-In Session

South Warrnambool residents are invited to a community information session on the progress of the South Warrnambool Flood Investigation.

The session is at 6pm, Wednesday 7 June 2023 at the Merrivale Football Netball Club. It will include a presentation of the flood modelling and mapping so far, after which residents will be encouraged to provide feedback on the draft maps.

From 31 May to 14 June residents will also have an opportunity to contribute to the flood investigation online at **www.yoursaywarrnambool.com.au**

The flood investigation of riverine and storm tide (coastal) flooding for South Warrnambool is a joint project between Council and the Glenelg Hopkins Catchment Management Authority (GHCMA) with consultants Venant Solutions engaged to provide specialist expertise and advice.

www.warrnambool.vic.gov.au

27/05/2023 - public notices

Noticeboard

Feedback wanted: Draft Budget 2023-2024

You are invited to provide feedback on Council's draft Budget.

The draft budget is available online at corangamite.vic.gov.au/draftbudget or call us on 5593 7100 for a hardcopy.

You can provide feedback before midday, Wednesday 7 June by:

- Completing the online form at corangamite.vic.gov.au/draftbudget
- Emailing shire@corangamite.vic.gov.au
- Writing to the Chief Executive Officer, Corangamite Shire, PO Box 84, Camperdown, 3260.

Anyone providing feedback can make a presentation to a committee of Council on Tuesday 20 June. Council will consider adopting the Budget on Tuesday 27 June, 7 pm at the Killara Centre, Camperdown.

corangamite.vic.gov.au

27/05/2023 - public notices

Moyne Shire Council Community Update

Port Fairy Norfolk Island Pine leaf/branchlet litter collection

The next collection will take place on the week commencing Monday 5 June 2023 - Friday 9 June 2023.

Please pile all branchlets that you would like collected on the nature strip in the week leading up to this.

Road Closure

The Sisters - Garvoc Road will be closed between the Princes Highway and the Framlingham - Garvoc Road until June 9 due to bridge repair works following a traffic accident.

There will be no vehicle access to the bridge while repair works are undertaken in the coming weeks.

Rail Trail re-sheeting works

Due to the re-sheeting of the surface of the Port Fairy – Warrnambool Rail Trail between the Princes Highway in Port Fairy and Leddy Lane in Rosa sections of the trail will be progressively closed to all trail users. It is anticipated that the work will commence in Early June and be completed in early August.

Detour signage indicating the route around the closed section will be placed at either end of the section. The detours will necessitate riding on local roads.

The project is being managed by the Port Fairy - Warrnambool Rail Trail Committee with funding support from the Local Road and Community Infrastructure Fund.

2023-24 Draft Budget

Council hereby gives public notice that:

1. It has prepared its budget for the financial year commencing 1 July 2023 and ending 30 June 2024.
2. It intends to adopt the budget at the Ordinary Council meeting to be held on Tuesday 27 June 2023.

Copies of the proposed budget are available for inspection during normal office hours at:

- Moyne Shire Council offices – Princes Street, Port Fairy; 1 Jamieson Avenue, Mortlake
- Or can be downloaded from www.moyne.vic.gov.au

Any person proposing to make a written submission on a proposal contained in the budget must do so before 4pm on Tuesday 6 June 2023.

Submissions must be addressed to:

The Chief Executive Officer
Moyne Shire Council
PO Box 51
Port Fairy Vic 3284

Any person or persons may present their budget submission to council workshop on Friday the 9th of June 2023 at the Port Fairy Council Office.

Kindergarten registrations

WARRNAMBOOL BOWLS CLUB INC.

Warrnambool Bowls 133rd Annual General Meeting

will be held

Wednesday 28th June 2023 at 7.00pm

at the Warrnambool Bowls Club

75 Timor Street Warrnambool

VR4820427

22/05/2023 - public notices

Conflict comes home

The previous year, 1939 had seen a resurgence in football but with the war breaking out in Europe, this was certainly going to change. The community prepared to farewell Australian conscripts and volunteers and the dynamics of most people's lives changed drastically. With this background, the KIFA had real difficulty in getting a quorum for the AGM as the clubs kept holding off with their AGM.

At the Grassy Football Club Player Revue held in the 1940s GFC stalwart and 1940 club secretary Eddie Henderson, far right, took to the stage.

TROY SMITH

WHEN a quorum was finally gained it was found that people had taken some dodgy liberties with the KIFA president L C Ross stores during the KIFA dinner.

Mr Ross (and it appears a few others) had quite fairly had enough and wrote letters to the King Island News admonishing the "lack of respect and bad sportsmanship" shown to him.

A lot of the goodwill that had advanced the game so much the previous year went missing.

Mr Ross resigned but eventually came back to the president's role in an effort to get the season moving. The press reported that "the mountain laboured and brought forth a mouse."

To add to this, a motion was presented to the KIFA and passed to revert to district football with Currie gaining the immediate Currie area while Grassy and North shared the North and South.

This motion and others were passed and then subsequently rescinded at the next meeting due to perceived "preferential treatment". To make matters worse the KIFA secretary Mr J C Dwyer had left the island, as had the Grassy Football Club founding figure president/captain/coach and star player, the Reverend Gil W Duthie. Both of these gentlemen were instrumental in the energy and focus of the successful previous season.

The newspaper football writer was also gone and the write-ups we rely on today were very short and inconsistent.

To the association's credit, the season got underway, even if it was somewhat subdued. The Grassy football club appointed a new president Mr F Brennan, the vice president was Mr I Edwards whilst the secretary remained the redoubtable Mr Eddie Henderson. The new captain was Frank Elliot. No references were found to the other 2 clubs' AGM, but M Scott was the new NFC secretary and Keith Reville was their captain again.

The crowd for the opening game was described somewhat sarcastically. "The Currie oval certainly had no difficulty in coping with the influx of spectators". North was strong from the get-go thrashing Grassy by booting 15 goals, whilst Grassy remained goalless.

Ron Stillman and Watty Scott getting some kudos alongside the brilliant McHughs and Begie. Whilst Bill Fisher did his best to "infuse some system into Grassy's play".

North then beat Currie by 27 points with Reville and the McHughs getting mentions. Grassy copped another pasting when North kicked 16-16-112 to Grassy's 1-9-15. The brilliant Frank (Pop) Elliot was wasted up forward whilst the Williams and McHughs were prominent for North.

North won their first 5 games with Currie pushing them at Yarrabacoona to get within 4 points.

The only glitch for North came when a player was reported for striking the central umpire (W Lansing). No tribunal result was found for this most serious charge.

Grassy then got within 2 points of Currie and pushed North to a 6-point loss late in the season kicking 9 goals in that game. North also dealt with Currie by 6 points with the McHughs and Williams again prominent whilst Lofty Darley and Whitty did some good work for Currie.

While more of the local boys were being feted and farewelled as they shipped out to training camps and to Europe, North went on their merry way recording strong victories over all and sundry. The NFC recorded 9 wins to Curries 4 wins and Grassy was winless.

The last game between Currie and Grassy was not played and although we couldn't find the results of one North v Currie match it was reported that North were undefeated for the season. The best players mentioned throughout the season were for North: Bob and Max McHugh, Keith Reville, Lindsay Williams, Max Williams, Watty Scott, Fred Summers, Watson and William Begie. For the CFC: Lofty Darley, Pat and Phil Farrell, Len Barnes, Jim Graham, Bill Groom and Jack Marshall. Grassy was best served by: Frank Elliot, F Brennan, Monty Yeomans, Plant, Alf Moles, Bill Fisher & Towns.

Grassy hadn't qualified for the finals so we were straight off to another North and Currie Grand final. The first quarter was very even with both sides kicking 4 goals and the second followed the script with the play being mainly held in the centre of the ground and at half time Currie had worried North with a 3-point lead. The pace was telling on the older Currie players in the third term and North took advantage, building a 14-point lead at the last change. Two quick goals to North made it look like it was all over, but Currie matched those goals. North again goaled and ran out 21-point winners in a great match.

The best players for North were Lindsay & Max Williams, Jack Coulter, Watty Scott, Bob McHugh, Watson, Jack Summers and Tom Wiltshire. Jack Coulter kicked 4 goals, Alf Moles 3, Jack Summers, Watty Scott and Bob McHugh 1 each.

Currie was best served by Len Morrison, Jack Marshall, E (Ted) Curtishley, Len Barnes, Earl Smith and the Farrells - Phil and young Dave.

The Currie goals came courtesy of Dave Farrell, Len Barnes, Bill Groom and Drake. Jack Summers was declared the winner of the best junior trophy but there was no mention of best players and goal kickers nor were any junior or schoolboy football games recorded.

Throughout the year there were ongoing King Island War Service fundraisers from balls through luncheons and sporting events to raise money for the fund and for Comfort parcels, containing socks, balaclavas, handkerchiefs and similar. These were sent regularly to King Island 'sons' in camps and to those deployed overseas and by mid-year more fundraising and weekly wages donations were called for as "the number of parcels was growing large."

nteresting game

LEFT:
Bailey Rainbow with firm hands goes for a big kick, with Alex Goldsmith, Rory Taylor, Ned Hunter, and Brandon Bloomfield.

LEFT: Loose slippery ball Matthew Button. Luke Graham, Ryan Frosi Jeramy Summers, Jack Noseda

BELOW: It's straight through Marty Monson. David Vellekoop and Jack Noseda.

George Freeman has a long reach, with Les Bonner on his tail in the juniors.

FINAL SCORES

King Island Football Association Scores 17-06-2023

JUNIORS

Grassy	**North**
1-1-7	0-2-2
4-3-27	0-3-3
5-4-34	3-5-23
7-4-46	3-7-25

Grassy
Goals: Cruz Osborne 3, R. Esquerra 2, I. Daniel, T. Berkin
Best: R. Esquerra, T. Berkin, Chase Osborne, Cruz Osborne, E. McGarth, I. Daniel, X. Berkin, T. Payne
North
Goals: H. Lincoln, M. Poulson, L. Reeman
Best: L. Martin, O. Martin, H. Lincoln, L. Reeman, T. Button, S. Bowling, T. Hyde

SENIORS

Grassy	**North**
3-4-22	0-1-1
5-4-34	2-6-18
5-7-37	3-7-25
7-10-52	4-9-33

Grassy
Goals: T. Rhodes 3, F. Tatawaqua 2, J. Taylor, Cruz Osborne
Best: S. Reeve, J. Noseda, J. Taylor, R. Taylor, R. Frosi, B. Blomfield
North
Goals: Jeramy Summers 2, M. Button 2
Best: A. Goldsmith, Justin Summers, M. Button, Jeramy Summers, D. Ellis, T. Cook

APPENDIX K

Summary of Feedback Received from Relevant Persons

*To avoid unnecessary repetition in relation to the 'Reference to Location within EP' column, all unedited correspondence is provided within Appendix H and meeting minutes and phone records are provided in Appendix I, and the different versions of the information sheet provided can be viewed in Appendix J.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
3D Oil	01-06-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
3D Oil	01-06-2022	Email FROM relevant person	Automatic reply notifying receipt of email and that the stakeholder contacted will be out of office from the 1st to the 6th of June.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
3D Oil	15-02-2023	Email FROM relevant person	Reply email from 3D Oil agreeing with previous email from TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
3D Oil	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
3D Oil	15-02-2023	Email TO relevant person	Reply email to 3D Oil thanking them for their email and advising would be good to continue engagement as there may be overlaps and synergies with their plans in the Otway. TGS said they would keep them up to date with EP progress.	N	N/A	* (see note above table)	Continuing consultation.
3D Oil	15-02-2023	Email FROM relevant person	Reply email from 3D Oil advising they have no interest in the survey which may change but unlikely.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AB Hunter Fisheries	12-08-2022	Email FROM relevant person	The stakeholder explained that they represent clients who wish to supply a chase vessel for the planned Otway Basin survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AB Hunter Fisheries	18-08-2022	Email TO relevant person	TGS/Schlumberger explained that they are currently in the early stages of submitting the Environment Plan (EP) for assessment by the regulator, NOPSEMA. Subject to the EP being approved, actual survey phases over the 5-year period covered by the EP will depend on TGS and SLB securing interest from petroleum companies in the region. TGS/Schlumberger explained that exact survey timing has not been confirmed, and that operation and management of survey vessels is done internally. Further information was requested on the vessel and the specific projects it has previously been contracted to support in the region.	N	N/A	* (see note above table)	Continuing consultation.
AB Hunter Fisheries	23-08-2022	Email FROM relevant person	The stakeholder listed the occasions when the [vessel name] has worked as a support vessel, and attached vessel details.	Y - Vessel details	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
AB Hunter Fisheries	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AB Hunter Fisheries	20-02-2023	Email FROM relevant person	ABH emailed TGS to provide an expression of interest for their chase vessel to assist with the project and provided details of the chase vessel.	Y - Details of chase vessel for consideration.	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
AB Hunter Fisheries	20-02-2023	Email TO relevant person	TGS responded to ABH email sent earlier that day lodging expression of interest for their chase vessle to assist the project.	N	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	15-02-2023	Email TO relevant person	Reconnected with specific ACV representative to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	16-02-2023	Email TO relevant person	TGS emailed ACV general email address to advise of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	17-04-2023	Email TO relevant person	TGS emailed ACV general email address to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ACV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	26-04-2023	Email TO relevant person	TGS emailed ACV (specific ACV representative) to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ACV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	22-05-2023	Phone call TO relevant person	SLB called ACV to follow up on previous unanswered emails regarding their proposed marine seismic survey however there was no answer. SLB left ACV a message to return their call as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Abalone Council Victoria	23-05-2023	Phone call TO relevant person	SLB called ACV to follow up on phone call and message left the day before regarding their proposed marine seismic survey however there was no answer. SLB left ACV a message to return their call at a convenient time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Abalone Council Victoria	26-05-2023	Phone call TO relevant person	SLB called ACV to follow up on phone call and message left the day before regarding their proposed marine seismic survey. The ACV reception asked SLB to leave their contact details and they would get the relevant ACV representative to call them back. SLB left their contact details and ACV confirmed they would pass their details on.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Abalone Council Victoria	26-05-2023	Email TO relevant person	TGS replied to ACV's email received earlier that day thanking ACV for their reply. TGS asked ACV to let them know if they would like to set up a meeting to discuss [their proposed marine seismic survey] in more detail, providing phone contact details if they would like to have a call instead.	N	N/A	* (see note above table)	Continuing consultation.
Abalone Council Victoria	26-05-2023	Email FROM relevant person	ACV replied to TGS' earlier communications regarding their proposed marine seismic surveys and advised their emails had been going to their junk folders. ACV advised they have forwarded the information to their CEO (details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Abalone Victoria Central Zone	28-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Victoria Central Zone	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Abalone Victoria Central Zone	1-06-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but following feedback from others realise their email may have been diverted to a junk folder. TGS attached the information sheet and included the previous email sent to the general AVCZ email address on 28/04/2023. TGS added they would like to understand AVCZ's functions, activities and interests that may be impacted by the proposed activity and whether AVCZ has received sufficient information to determine if there are likely to be any impacts. TGS asked AVCZ to let them know prior to 06/06/2023 if they have any input so they can consider their information within their survey planning and development of the environmental plan before submitting to NOPSEMA mid-June. TGS also attached guidance from NOPSEMA to help with providing feedback about the survey and asked AVCZ to let them know if they have any queries about their consultation program so they can make sure they can effectively participate in the process. TGS closed the email by stating if they had any questions or would like more information to call or email to discuss further.	Y - Information sheet and NOPSEMA consultation guidance	N/A	* (see note above table)	Continuing consultation.
Abalone Victoria Central Zone	1-06-2023	Email FROM relevant person	AVCZ replied to TGS' email sent earlier that day asking what the response date is proposed now.	N	N/A	* (see note above table)	Continuing consultation.
Abalone Victoria Central Zone	1-06-2023	Email TO relevant person	TGS replied to AVCZ's email received earlier that day thanking them for their reply. TGS said as they are finalising their draft environment plan for NOPSEMA submission end of the following week, as soon as they can would be appreciated so TGS can address any concerns before submission. TGS added if that is too tight, TGS can include AVCZ's preliminary concerns and address detailed concerns within the public consultation period following their first submission to NOPSEMA and asked AVCZ if that would work?	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Council Tasmania	4-05-2023	Email FROM relevant person	AHCT replied to TGS' email sent earlier that day thanking them for the email and information sheet. AHCT advised the council's next meeting is 26/05/2023 and they will send the email and information sheet to the Chair for consideration. AHCT continued they will be preparing the agenda for the May meeting in the next couple of weeks and will advise TGS if an online meeting will work.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation	* (see note above table)	No action required. Continuing consultation.
Aboriginal Heritage Council Tasmania	4-05-2023	Email FROM relevant person	AHCT replied to TGS' email sent earlier that day thanking TGS and said they will let the Chair know TGS can visit if an online meeting won't work.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation	* (see note above table)	No action required. Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Aboriginal Heritage Council Tasmania	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS asked AHCT to advise if they'd like to discuss further to get in touch and as that all comments ae provided by 12/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Council Tasmania	4-05-2023	Email TO relevant person	TGS replied to AHCT's email received earlier that day thanking them for their quick reply. TGS confirmed with AHCT they can visit on 26/05/2023 if an online meeting won't work.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Council Tasmania	15-05-2023	Email TO relevant person	AHCT replied to TGS' email sent 04/05/2023 thanking TGS for the offer to brief them on their proposed marine seismic survey and the opportunity to provide feedback. AHCT advised the information provided in the information sheet and email was sufficient for council at that stage. AHCT closed their email advising if the council finds there is a need to discuss the survey further they will keep TGS' offer in mind to get in contact.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Council Tasmania	23-05-2023	Email TO relevant person	TGS emailed AHCT acknowledging their response sent 15/05/2023 and asked them to get in contact if they any additional information.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	24-04-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 02/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	26-04-2023	Phone call TO relevant person	TGS called AHT to follow up on email and information sheet TGS sent on 24/02/2023 and to request a meeting with AHT next week while TGS will be visiting Tasmania. The receptionist said they would find the best person to speak to and call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Heritage Tasmania	26-04-2023	Email TO relevant person	TGS emailed AHT following phone call earlier that day confirming TGS will be visiting Tasmania next week and would welcome the opportunity to meet to discuss their plans and hear if they have any concerns. TGS advised that if a meeting is not convenient next week, then TGS can arrange an online meeting at their convenience.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	27-04-2023	Email FROM relevant person	AHT replied to TGS' email sent 26/04/2023 advising the following: - AHT administers the Aboriginal Heritage Act 1975 and are occupied predominantly with the tangible heritage of Tasmanian Aboriginal people. - the Tasmanian Aboriginal Register does not record offshore Aboriginal heritage and AHT is unaware of any work been undertaken in Tasmania to identify any underwater sites. AHT advised that given the project appears focused on the waters of Bass Strait, they do not feel their staff could add value to the project at this time. AHT continued if TGS is seeking cultural perspective, or an intangible heritage viewpoint, then AHT suggested contacting one of the Aboriginal community organisations listed on the ORIC (Office of the Registrar of Indigenous Corporations).	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Aboriginal Heritage Tasmania	3-05-2023	Email FROM relevant person	AHT replied to TGS' email sent earlier that day saying if TGS is visiting then they would meet to discuss, as might be easier than via email. AHT added that if there was an oil spill that reaches land then they would have an interest and they are assuming this type of event should trigger an EPA response and they have recently worked with EPA to devise a process by which the EPA alert AHT in such events. AHT advised they are free Thursday from 10:00 am but not Friday.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation	* (see note above table)	No action required. Continuing consultation.
Aboriginal Heritage Tasmania	3-05-2023	Email TO relevant person	TGS emailed AHT thanking them for their response received 27/04/2023. TGS advised they were checking if they consider themselves a relevant person based on the area that may be impacted. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why AHT was triggered as a potential relevant person as the area that may be affected overlaps with the west coast of Tasmania. TGS asked AHT to confirm whether they believe they are a relevant person based on this information and if so, if they require more information and TGS will get in contact about the best way to do that. TGS advised they would be visiting Hobart tomorrow and Friday if they'd like to meet to discuss further. TGS also advised they are liaising with the Aboriginal Land Council of Tasmania who have provided a detailed submission and queries.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	3-05-2023	Email TO relevant person	TGS replied to AHT's email received earlier that day agreeing would be much easier to meet and suggested a meeting time and location on Thursday.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	3-05-2023	Email TO relevant person	TGS emaiiled AHT a meeting invite for 04/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	4-05-2023	Meeting with relevant person	TGS, SLR and SLB met with AHT to provide information about the proposed survey, to identify any potential impacts to AHT's functions, interests or activities and discuss any queries AHT has with the proposed survey. The meeting's key comments and queries included: - Interest around history, purpose and occurrance of marine seismic surveys. - NOPSEMA governing body to approve environment plan. - Fuel spill - acting authority, likelihood of beaching, national response plan. - Consultation process and suggested other relevant persons. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Aboriginal Heritage Tasmania	16-05-2023	Email TO relevant person	TGS emailed AHT a copy of the minutes and presentation from their meeting held 04/05/2023. TGS also provided literature reference as discussed during meeting.	Y - Meeting minutes, copy of presentation and literature reference	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	22-05-2023	Email TO relevant person	TGS emailed AHT asking if they had contact details for Six Rivers Aboriginal Corporation as TGS is not able to make contact with them.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	22-05-2023	Email FROM relevant person	AHT replied to TGS' email sent earlier that day providing contact details for Six Rivers Aboriginal Corporation.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	22-05-2023	Email TO relevant person	TGS replied to AHT's email received earlier that day thanking them but advised the contact details they provided for Six Rivers Aboriginal Corporation were the same details they had already.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Heritage Tasmania	23-05-2023	Email FROM relevant person	AHT replied to TGS' email the day before providing additional contact details for Six Rivers Aboriginal Corporation, including a postal address.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	29-03-2023	Email TO relevant person	TGS emailed ALCT to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS asked if ALCT could advise the name of groups TGS may need to speak to in the lower NSW area to refine the list of who they contact, closing the email by advising any information would be very much appreciated.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	29-03-2023	Email TO relevant person	TGS emailed ALCT immediately following the previous email to apologise as had provided reference to lower NSW, not Tasmania as it should've read.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	4-04-2023	Phone call TO relevant person	TGS called ALCT to follow up on their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to advise they were calling about the proposed marine seismic survey in the Otway Basin and they had sent an email on 29/03/2023 and to call them back (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Land Council of Tasmania	11-04-2023	Phone call TO relevant person	TGS called ALCT to follow up on their phone call from 04/04/2023 and email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to advise they were calling about the proposed marine seismic survey, phone call from 04/04/2023 and email from 29/03/2023 and left contact details to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Land Council of Tasmania	11-04-2023	Email TO relevant person	TGS emailed ALCT to follow up on the email sent 29/03/2023 (copy provided) explaining they would really appreciate their help with identifying traditional owner groups in Tasmania. TGS provided their direct mobile contact details and closed the email by thanking them.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	17-04-2023	Phone call FROM relevant person	ALCT called TGS back following voicemail message left earlier in the day. ALCT asked TGS to send the information sheet to an alternative email address provided. TGS emailed the information sheet and called ALCT to ensure they had received it. ALCT confirmed they had received the information sheet and advised they have forwarded to the manager who is not in the office today. ALCT advised TGS should call back on Wednesday when the manager will be back in the office.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation.	* (see note above table)	No action required. Continuing consultation.
Aboriginal Land Council of Tasmania	17-04-2023	Phone call TO relevant person	TGS called ALCT to follow up on the email sent 11/04/2023 but there was no answer. TGS left a message for ALCT to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Land Council of Tasmania	17-04-2023	Email TO relevant person	TGS emailed ALCT following their phone call earlier that day. TGS thanked ALCT for returning their call and asked if they could please help with some information. TGS advised they propose to carry out a marine seismic survey off the coast of Tasmania and Victoria and were wanting to speak to traditional owner groups that may be interested in sea country that overlaps the EMBA (image provided). TGS asked if they could advise the names of the groups TGS may need to speak to in Tasmania. TGS closed the email stating that any help would be very much appreciated to refine the list so they are not contacting every group in Tasmania and burdening them unnecessarily.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	19-04-2023	Email FROM relevant person	ALCT replied to the email TGS sent 17/04/2023 providing information about TGS' proposed marine seismic survey. ALCT advised they stand opposed to the seismic testing in the Bass Strait, explaining that ALCT are saltwater people and the survival of their culture depends on the health of the ocean. ALCT's main concerns are summarised below: - impact to zooplankton as the food source which underpins the entire ocean ecosystem. - mutton birds are a very important cultural animal to Tasmanian Aboriginal people - reference to the impacts at the bottom of the food chain impacting mutton birds. - suggested testing zone within whale migratory route and mitigation measures would not satisfy the Tasmanian Aboriginal Community (TAC). - the TAC has witnessed numerous mass whale strandings on the west coast of Tasmania in 2022. ALCT commented that Aboriginal people have cared for the coast of Tasmania for thousands of years and monitor the occurrence of strandings over time. TAC stated although TAC cannot say with certainty that seismic testing and the increase in mass whale strandings are interconnected, TAC is not prepared to discount their connection with any confidence. TAC closed their offering they are happy to discuss should TGS wish.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Various objections or claims regarding impacts to zooplankton, invertebrates as food chain supply, and testing zone/whale migratory pathways were raised regarding the seismic survey. Impacts from acoustic disturbance on sensitive receptors has been outlined with **Section 7.2.2.2.** Specific impacts on matters raised by ALCT have been discussed within: **Section 7.2.2.2.1** (Plankton), **Section 7.2.2.2.2** (Benthic Invertebrates), **Section 7.2.2.2.7 & 7.2.2.3.6** (Marine Mammals), with appropriate control measures listed in **Section 7.2.5**.	Continuing consultation.
Aboriginal Land Council of Tasmania	19-04-2023	Phone call TO relevant person	TGS called ALCT to follow up email and phone call from 17/04/2023, however the ALCT manager was unavailable. The receptionist advised she would forward the email to the manager again with a message that TGS would welcome a meeting with ALCT and to let TGS know if they would like a meeting.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Land Council of Tasmania	19-04-2023	Phone call TO relevant person	TGS called ALCT following email received earlier that day. ALCT suggested TGS respond to their email with additional information that they will pass on to the council, when they can then have a meeting to discuss. ALCT said they would be happy to facilitate a meeting but won't be a warm reception. ALCT closed the call by explaining that coastal people rely on the ocean being healthy and have recently been outraged by a windfarm development because of the direct impact on mutton birds.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Aboriginal Land Council of Tasmania	26-04-2023	Email TO relevant person	TGS replied to ALCT's email received 19/04/2023 providing a formal submission about their proposed survey with the following summarised information: - TGS has undertaken a detailed assessment of the potential impacts of the survey on zooplankton including an underwater acoustic modelling study which assesses the noise impacts on different receptors, using sound thresholds for mortality and mortal injury. - TGS is preparing the environment plan using the available literature on potential impacts to plankton from seismic survey as part of their risk assessment. - TGS can provide ALCT a summary of their EP's assessment of the potential seismic acoustic impacts on plankton. - TGS do not expect there to be any impact to birds on top or above the water from seismic activities (reasons provided). - TGS has extensive control measures in place to avoid impacts on marine mammals (examples provided). - TGS believe there is no association between any seismic survey and marine mammals stranding events across the world. TGS closed the email advising TGS and their environmental consultant will be visiting Tasmania next week and would like to meet with ALCT or alternatively can meet online and to advise TGS what they would prefer. Refer to Appendix H for more detailed submission.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	1-05-2023	Phone call TO relevant person	TGS called ALCT to request a meeting later that week to discuss their feedback on their proposed mairine seismic survey, while TGS was visiting Tasmania but there was no answer. TGS left a message regarding having a meeting this week and asked ALCT to call back and advised they would send a follow up email also.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Land Council of Tasmania	1-05-2023	Email TO relevant person	TGS emailed ALCT following up on their planned trip to Tasmania advising they would be in Hobart on Thursday and Friday and would welcome a meeting with ALCT. TGS advised alternatively they could meet online and to just let them know what they prefer.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Land Council of Tasmania	11-05-2023	Email TO relevant person	TGS emailed ALCT following up on their previous emails sent 01/05/2023 and 26/04/2023 to see if ALCT would like to meet to discuss their proposed marine seismic survey further. TGS closed their email stating they would welcome the opportunity to provide more details in an online meeting.	N	N/A	* (see note above table)	Continuing consultation.
Aboriginal Launceston	1-03-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is planning to undertake marine seismic survey in Otway Basin and seeking to engage with AL as a potential relevant person in accordance with government consultation requirements. TGS advised that if AL provide an appropriate contact, they will provide more information. TGS also advised they would like to knowwhether AL has any interests or activities that may be affected by the survey so TGS can learn what these might be and discuss how any impacts may be avoided or mitigated. TGS also invited AL to let them know if they would like to ask any questions or meet in person to go over the proposed survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	13-03-2023	Online enquiry form submitted	SLB submitted another online enquiry form asking for a contact person to discuss the seismic survey with.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	14-03-2023	Phone call TO relevant person	SLB called AL to follow up on the online enquiry form submitted 13/03/2023 requesting a contact person to provide more information related to the Otway Basin 3D Marine Survey. AL requested SLB forward an email request and they will forward to management for further contact and discussion. SLB suggested they will send the factsheet specifically developed for Traditional Owner groups and AL confirmed this would be good. SLB thanked AL and confirmed that would send factsheet today and look forward to futher communications in the future.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	24-03-2023	Email TO relevant person	SLB emailed AL following phone call earlier advising they would provide a factsheet of information about their proposed marine seismic survey in the Otway Basin. The factsheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Launceston	31-03-2023	Email TO relevant person	SLB emailed AL to resend email from 22/03/2023 asking if they received this email and had a chance to discuss with their manager regarding who SLB could connect with online to discuss the proposed project. SLB attached the updated TO factsheet again.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Launceston	5-04-2023	Phone call TO relevant person	SLB called AL to follow up on previous correspondence regarding their marine seismic survey in the Otway Basin and spoke to the AL receptionist. The receptionist advised the previous AL representative that SLB had been corresponding with no longer works for AL. SLB updated the receptionist on the past conversations with AL and asked if the receptionist could forward and discuss the information sheet and email to their CEO. The receptionist confirmed they would do this and asked SLB to resend the information sheet. SLB confirmed they would resend the information sheet and be in contact after the Easter weekend to follow up.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	5-04-2023	Email TO relevant person	SLB emailed an alternative contact with AL forwarding the previous emails sent to AL on 24/03//2023 and 31/03/2023 about the proposed marine seismic survey in the Otway Basin and attempting to arrange a meeting with AL to discuss further. SLB asked AL to let them know if they receive this email and the information has been passed on to their manager as they would like to discuss further in order to understand all potential concerns AL may have. SLB advised they could arrange an online meeting at their convenience and attached the information sheet.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Launceston	14-04-2023	Phone call TO relevant person	SLB called AL's landline but AL contact was not available.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	17-04-2023	Phone call TO relevant person	SLB called AL to follow up on previous phone call made on 14/04/2023. AL advised they had not received the factsheet sent to their reception email and requested it be sent direct to them. AL advised they would then send the factsheet to their CEO. SLB confirmed they would resend the factsheet and would follow up once sent.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	17-04-2023	Email TO relevant person	SLB emailed AL as discussed earlier in the day via phone call to provide a copy of the information sheet. SLB asked AL could pass on the information sheet to their management team and let SLB know if AL would like to discuss with them online. SLB continued that if not required and there are no further concerns outside what is explained on the factsheet, could AL let them know by return email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Aboriginal Launceston	21-04-2023	Phone call TO relevant person	SLB called AL to follow up on previous correspondence and spoke to receptionist who advised the AL representative SLB needs to speak to will call back this afternoon.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Aboriginal Launceston	27-04-2023	Phone call TO relevant person	SLB called AL to follow up on previous correspondence and spoke to receptionist who advised the AL representative SLB needs to speak to was out of the office until the weekend.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA SESSF Commonwealth Trawl Manager and SPF Manager	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA SESSF Demersal and Midwater Trawl, SSJF, ETBF and BSCZSF Manager	14-02-2023	Email TO relevant person	Out of office reply with alternative contact while on long term leave.	N	N/A	* (see note above table)	Continuing consultation.
AFMA SESSF Demersal and Midwater Trawl, SSJF, ETBF and BSCZSF Manager	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA SESSF Demersal and Midwater Trawl, SSJF, ETBF and BSCZSF Manager	20-02-2023	Email TO relevant person	Forwarded original email forwarded to AMFA SESSF Demersal on 15/02/2023 advising changes to survey and updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA SESSF Gillnet Hook and Trap Manager	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Shark Resource Assessment Group	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Small Pelagic Fishery (SPF) Resource assessment group	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Small Pelagic Fishery (SPF) Resource assessment group	20-02-2023	Email FROM relevant person	Automated reply to email address advising undeliverable.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA Small Pelagic Fishery (SPF) Resource assessment group	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA South East Management Advisory Committee (SEMAC)	20-02-2023	Email FROM relevant person	Automated reply to email address advising undeliverable.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA South East Management Advisory Committee (SEMAC)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA South East Management Advisory Committee (SEMAC)	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA South East Management Advisory Committee (SEMAC)	12-05-2023	Email FROM relevant person	Automated reply to email address advising of an alternative contact within the organisation.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA South East Resource Assessment Group (SERAG)	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA South East Resource Assessment Group (SERAG)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group	14-02-2023	Email TO relevant person	TGS responded to previous email regarding not having received correspondence before and advised there has been a change in contact email address for the project. TGS invited them to get in contact if any questions or concerns regarding the activity being proposed.	N	N/A	* (see note above table)	Continuing consultation.
AFMA Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
AFMA Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group	13-02-2023	Email FROM relevant person	Stakeholder queried previous email from TGS as never received correspondence in past.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA Southern Bluefin Tuna Fishery (SBTF) Management Advisory Committee	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Southern Bluefin Tuna Fishery (SBTF) Management Advisory Committee	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Southern Bluefin Tuna Fishery (SBTF) Management Advisory Committee	21-02-2023	Email FROM relevant person	Relevant person responded to email TGS sent 14/03/2023 advising they are aware ASBTIA is in consultation with TGS on this [project].	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA Southern Bluefin Tuna Fishery (SBTF) Management Advisory Committee	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Southern Squid Jig Fishery (SSJF) resource assessment group	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
AFMA Southern Squid Jig Fishery (SSJF) resource assessment group	20-02-2023	Email FROM relevant person	Automated reply to email address advising undeliverable.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
AFMA Southern Squid Jig Fishery (SSJF) resource assessment group	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	17-04-2023	Email TO relevant person	TGS emailed ANGAIR to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ANGAIR to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	25-05-2023	Email FROM relevant person	ANGAIR replied to TGS' email sent 22/05/2023 thanking TGS for their email invitation. ANGAIR said they feel this is not in their field of area or expertise.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	25-05-2023	Email TO relevant person	TGS replied to ANGAIR's email received earlier that day thanking them for their response. TGS asked if ANGAIR would like more information about the project or do they feel the survey is not relevant or of interest. TGS continued they are happy to provide more information or alternatively they can remove ANGAIR from the consultation program if they do not wish to receive any more communications.	N	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	25-05-2023	Email TO relevant person	TGS replied to ANGAIR's email received earlier that day acknowledging their request to be removed from the consultation list and offered for ANGAIR to get in contact if they have any queries.	N	N/A	* (see note above table)	Continuing consultation.
Anglesea, Aireys Inlet Society for the Preservation of Flora and Fauna (ANGAIR)	25-05-2023	Email FROM relevant person	ANGAIR replied to TGS' email sent earlier that day advising they wish to be removed from the consultation list.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Fisherman's Cooperative	17-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 24/03/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Fisherman's Cooperative	20-03-2023	Email TO relevant person	TGS emailed ABFC as previous email sent on 17/03/2023 did not have the [information sheet] attached and this email was providing the [information sheet].	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Fisherman's Cooperative	22-03-2023	Phone call TO relevant person	SLB called ABFC to follow up on unanswered emails regarding their proposed marine seismic survey however there was no answer. SLB left ABFC a message to return their call at a convenient time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Fisherman's Cooperative	17-04-2023	Email TO relevant person	TGS emailed ABFC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ABFC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Fisherman's Cooperative	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Fisherman's Cooperative	25-05-2023	Phone call TO relevant person	SLB called ABFC to follow up on phone call and message left 22/05/2023 regarding their proposed marine seismic survey however there was no answer. SLB left ABFC a message to return their call at a convenient time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Fisherman's Cooperative	30-05-2023	Phone call TO relevant person	SLB called ABFC to follow up on previous attempts to communicate with them regarding their proposed marine seismic survey within Otway Basin. ABFC advised they had forwarded the email containing the information sheet to all of their six members. SLB advised they would be visiting the area if there was anyone from ABFC that wanted to meet and discuss the project further. The ABFC member advised they would check whether the Director/Chairman would like to meet. ABFC added there is not much more they can do if the members are not getting back to SLB, however confirmed they had received enough information and had no concerns from their side. SLB provided contact details for ABFC to call back.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Apollo Bay Fisherman's Cooperative	31-05-2023	Meeting with relevant person	SLB, TGS and SLR visited ABFC to see if they wanted to meet and discuss the proposed marine seismic survey within the Otway Basin, however the appropriate representatives were no available. SLB left their contact details for them to call if they wanted to meet.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Landcare	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	17-04-2023	Email FROM relevant person	ABL replied to TGS' email sent earlier that day regarding their proposed marine seismic survey within the Otway Basin. APL explained they are quite concerned about a number of elements of this project and would like a meeting to discuss. APL mentioned their concerns with affecting marine life including threatened species (e.g. blue whales) and fishing industries which the community relies on. APL continued that searching for fossil fuels when APL knows they are destroying lives and causing extinctions around the world seems counterintuitive to them. APL advised they would like to convene a meeting as they don't think this is an appropriate development and have many questions to ask.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Blue whales: **Sections 7.2.2.3.6** and **7.2.2.4.2**, with control measures specific for marine mammals listed in **Table 84**. Commercial fishing industry: Imapcts of the seismic survey activity for commercial fishers, specifically in relation to underwater noise are discussed in detail in **Section 7.2.3.1.** Other specific impatcs are discussed in detail in **Section 7.2.2.3.2** (bony fish / tuna behavioural impacts), and **Section 7.2.2.2.1.2** (duration and extent of zooplankton exposure), **Section 7.2.2.2.1.4** (rock lobster larvae) and **Section 7.2.2.2.3.2** (bony fish larvae). Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP.	Continuing consultation.
Apollo Bay Landcare	17-04-2023	Email TO relevant person	TGS emailed ABL to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ABL to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Apollo Bay Landcare	21-04-2023	Email TO relevant person	TGS replied to ABL's email received 17/04/2023 expressing their concerns with their proposed marine seismic survey. TGS advised they are available to meet with them and discuss their concerns and provide an overview of what is proposed, discuss the work in the environment plan and control measures that will be implemented to avoid or mitigate impacts on the marine environment. TGS asked if ABL would be available to meet on 27/04/2023 and to advise if this date is not suitable and provide a date that would work better. TGS asked who would be attending and to pass on names of those attending to include in the meeting invite. TGS also asked if ABL could provide a summary of questions to ensure they have the people at the meeting required to address their questions.	N	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	22-05-2023	Email TO relevant person	TGS emailed ABL to advise they would be visiting the area next week if they were available 31/05/2023 afternoon to discuss their queries and concerns raised in their email dated 17/04/2023. TGS asked ABL to advise if they were available and confirm a time.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	24-05-2023	Phone call TO relevant person	TGS called ABL to follow up on the email TGS sent 22/05/2023 but there was no answer. TGS left a message for ABL to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Landcare	24-05-2023	Email TO relevant person	TGS emailed ABL a meeting invite for 31/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	24-05-2023	Phone call FROM relevant person	ABL called TGS back following their call and message left earlier that day. ABL confirmed they could meet on 31/05/2023 at 15:00 hrs. TGS advised they would send out a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Apollo Bay Landcare	31-05-2023	Meeting with relevant person	TGS, SLB and SLR met with ABL to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with ABL: - impacts on marine mammals and control measures; - impacts on plankton; and - survey purpose and contributing to the effects of climate change. ABL advised they would discuss the information shared today and from previous communications with other team members and contact TGS if they have additional questions. SLR explained the next stage with NOPSEMA's completion check and release for public consultation as an opportunity to provide feedback. TGS advised they would provide ABL with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Acoustic impacts on marine mammals and control measures: **Sections 7.2.2.3.6** and **7.2.2.4.2,** with control measures specific for marine mammals listed in **Table 84.** Acoustic impacts on plankton: **Sections 7.2.2.2.1** (plankton), and **7.2.2.2.3.2** (fish eggs and larvae mortality), with control measures listed in **Table 84.** Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP.	Continuing consultation.
Apollo Bay Landcare	1-06-2023	Email TO relevant person	TGS emailed ABL to thank them for their meeting the day before and provide ABL with a copy of the presentation. TGS added they will send out the meeting minutes next week but to contact them if there are any further questions in the meantime.	Y - Copy of meeting presentation	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	9-06-2023	Email TO relevant person	TGS emailed ABL a copy of the meeting minutes for their record and review and asked ABL to advise if they would like anything changed or removed. TGS thanked ABL for their time and information and advised they have noted their concerns and queries. TGS asked ABL to advise if they would like to be kept updated with their progress and remain on consultation list or be removed from the consultation program. TGS asked ABL to let them know if they need any information going forward.	Y - Meeting minutes and copy of presentation	N/A	* (see note above table)	Continuing consultation.
Apollo Bay Landcare	16-06-2023	Email FROM relevant person	ABL replied to TGS' email sent 09/06/2023 providing a copy of the minutes for meeting held 31/05/2023 with amenments to the minutes. ABL also advised they presented TGS' story to the CoM and they unanimously voted they are against any further seismic testing in the waters off the coast of the Otways due to the harm it causes marine life and the potential for increased carbon emissions as a result of the surveying. ABL asked for this to be noted in the minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Australian Coastal Society Ltd - South Australian Chapter	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Coastal Society Ltd - South Australian Chapter	17-04-2023	Email TO relevant person	TGS emailed ACSL to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ACSL to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Coastal Society Ltd - South Australian Chapter	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Communication and Media authority (ACMA)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Australian Communication and Media authority (ACMA)	16-05-2022	Email FROM relevant person	Automatic reply notifying receipt of email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Communication and Media authority (ACMA)	17-05-2022	Email FROM relevant person	The email acknowledges that the ACMA received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS. Relevant person advised that the enquiry has been escalated for an expert response.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Communication and Media authority (ACMA)	08-06-2022	Email FROM relevant person	The ACMA communicated that Schedule 3A to the Telecommunications Act 1997 (link provided) provides for submarine cable protection zones to be declared around telecommunications submarine cables that are considered to be of national significance. As the proposed survey area is not in the vicinity of any existing protection zones, the ACMA had no comments regarding the proposal. The ACMA linked a map of the international submarine cables landing in Australia. Although none of the cables in the map appear to travel through the proposed area, the stakeholder encouraged TGS/Schlumberger to contact domestic submarine cable operators to discuss the proposed survey. The ACMA also noted that they do not generally provide contact details for the operators of any submarine cables in Australian waters and encouraged TGS/Schlumberger to make their own enquiries.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Communication and Media authority (ACMA)	8-06-2022	Email FROM relevant person	Relevant person emailed to confirm that none of their cables, as shown in their map, appear to travel through the area specified in email of 16/05/2022.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Communication and Media authority (ACMA)	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Communication and Media authority (ACMA)	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Communication and Media authority (ACMA)	17-03-2023	Email FROM relevant person	ACMA acknowledged email TGS sent to them on 14/03/2023. ACMA advised their role to regulate the submarine cable regime (providing a link to their website for more information about their role). ACMA encourage TGS to contact the owners of any submarine cables in the vicinity of the survey area if they haven't already. ACMA advised that from the information TGS had provided, the survey area overlaps the Indigo Central submarine cable system, owned by the Indigo Consortium (provided a link to Indigo website). ACMA recommended contacting the AHO for further assistance with identifying submarine cables near the survey area as they maintain records of geospatial coordinates submarine cables.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Communication and Media authority (ACMA)	27-03-2023	Email TO relevant person	TGS responded to ACMA's email sent 17/03/2023 thanking them for their information regarding contacting AHO and Superloop.	N	N/A	* (see note above table)	Continuing consultation.
Australian Communication and Media authority (ACMA)	16-05-2023	Email FROM relevant person	Automatic reply notifying receipt of email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Conservation Foundation	27-02-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is planning to undertake marine seismic survey in Otway Basin and seeking to engage with ACF as a potential relevant person in accordance with government consultation requirements. TGS advised that if ACF provide an appropriate contact, they will provide more information. TGS also advised they would like to know whether ACF has any interests or activities that may be affected by the survey so TGS can learn what these might be and discuss how any impacts may be avoided or mitigated. TGS also invited ACF to let them know if they would like to ask any questions or meet in person to go over the proposed survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Conservation Foundation	27-02-2023	Email FROM relevant person	Automated reply from ACF to TGS' online enquiry form submitted 27/02/2023 acknowledging the submission, advising they will read the message ASAP.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Conservation Foundation	17-04-2023	Email TO relevant person	TGS emailed ACF to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ACF to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Conservation Foundation	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority - South East Management Advisory Committee (AFMA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority - South East Management Advisory Committee (AFMA)	20-02-2023	Email FROM relevant person	Automated reply to email address advising undeliverable.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Australian Fisheries Management Authority (AFMA) - Southern and Eastern Scalefish and Shark Fishery Resource Assessment Group	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	11-05-2022	Email FROM relevant person	Automatic email from stakeholder advising that they is currently on leave. An alternative contact was provided.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	12-05-2022	Email TO relevant person	TGS state that they are contacting AFMA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet, maps and a summary of the Commonwealth fisheries	N/A	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	12-05-2022	Email FROM relevant person	Email undeliverable - Unable to determine addresses involved. Note, other AFMA contacts were successfully emailed.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited AFMA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	05-07-2022	Email FROM relevant person	The relevant person expressed that they have no specific comment on the proposal, but noted that it is important to consult with all operators who have entitlements to fish within the proposed area. The relevant person explained that once relevant operators have been identified, individual contact details can be requested. There is a cost associated with this service and the total price will depend on the complexity of the request. The stakeholder has not raised any objections to the proposal.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised. Given the number of fisheries and operators, and the costs and time associated with postal consultation, TGS and SLB will consult via the relevant fishing industry associations.	* (see note above table)	No action required. Continuing consultation.
Australian Fisheries Management Authority (AFMA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	15-03-2023	Email FROM relevant person	AFMA responded to email from TGS dated 15/02/2023 advising the fishery managers are currently reviewing the revised survey proposal. AFMA said they would value an online meeting with TGS to further understand the project and whom TGS has already consulted, especially the Commonwealth Fishing Industry.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	22-03-2023	Email TO relevant person	TGS replied to AFMA apologising for delay in responding to their email dated 15/03/2023. TGS advised they would welcome a meeting with AFMA and to please advise when in convenient for them.	N	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	27-03-2023	Email FROM relevant person	AFMA emailed TGS with meeting invite for 04/04/2023 at 12:30 pm.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	29-03-2023	Email TO relevant person	TGS replied to AFMA's meeting invite asking to move the proposed meeting from 04/04/2023 to 05/04/2023 as the same time.	N	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	29-03-2023	Email FROM relevant person	AFMA replied to TGS' email earlier that day regarding moving the proposed meeting time, advising the person TGS has been liaising with has gone on leave so will need to decline original meeting invite and an alternative contact will resend the invite for the following day (05/04/2023).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	29-03-2023	Email FROM relevant person	AFMA emailed TGS with an alternative meeting invite for 05/04/2023 at 12:30 (AEDT).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	30-03-2023	Email TO relevant person	TGS responded to AFMA thanking them for their previous email and meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Australian Fisheries Management Authority (AFMA)	30-03-2023	Email FROM relevant person	AFMA responded to TGS' email earlier that day, saying no problem [in response to TGS thanking them for their previous email].	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Fisheries Management Authority (AFMA)	5-04-2023	Meeting with relevant person	TGS, SLB and SLR met with AFMA to discuss the proposed survey. TGS and SLR provided a presentation discussing the survey details, existing environment and environmental values, examples of control measures, past commercial fishing effort, and cumulative impacts. The group then discussed consultation with AFMA clarifying that AFMA is a government body regulating Commonwealth commercial fishing. They can provide data on fisheries but don't represent fishers as such. AFMA recommended consulting just those fisheries that are relevant and keeping AFMA informed so they can anticipate what is happening with each fishery. The meeting closed with AFMA explaining how the fishers are experiencing significant consultation fatigue and increasing pressure with spatial competition. AFMA also commented seismic is very sensitive within the fishing industry. Refer to Appendix I for a copy of the full meeting minutes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Fishing Trade Assn	17-04-2023	Email TO relevant person	TGS emailed AFTA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked AFTA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fishing Trade Assn	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fishing Trade Assn	25-05-2023	Email TO relevant person	TGS emailed AFTA seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from AFTA to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked AFTA to reply prior to 31/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Fishing Trade Assn	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Hydrographic Office (AHO)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Australian Hydrographic Office (AHO)	18-05-2022	Email FROM relevant person	"The email acknowledges that the AHO received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will review the survey details. It was advised that data supplied would be registered, assessed, prioritised and validated in preparation for updating the Navigational Charting products.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Hydrographic Office (AHO)	19-05-2022	Email TO relevant person	TGS/Schlumberger thanked AHO for their reply. TGS/Schlumberger highlighted that the survey is in its preliminary stages. TGS/Schlumberger noted that details will be provided to AHO for inclusion in Notice to Mariners, and that this is subject to the acceptance of the EP and surveys going ahead. TGS/Schlumberger indicated to AHO that they do not believe that temporary vessel and survey activities will require including on navigational charts.	N	N/A	* (see note above table)	Continuing consultation.
Australian Hydrographic Office (AHO)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Hydrographic Office (AHO)	15-02-2023	Email FROM relevant person	Reply email to acknowledge email was received by AHO and advising the data provided will now be registered, assessed, prioritised and validated for updating navigational charting products. The reply email was from a personalised email address rather than the general email addressed being previously used.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Hydrographic Office (AHO)	6-06-2023	Email TO relevant person	TGS emailed AHO to provide an update on progress developing environmental plan and to ask AHO if there are any other submarine cables that overlap the survey operational area, or just the one they have already identified (image provided).	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Australian Hydrographic Office (AHO)	7-06-2023	Email FROM relevant person	Reply email to acknowledge email was received by AHO and advising the data provided will now be registered, assessed, prioritised and validated for updating navigational charting products. The reply email was from a personalised email address rather than the general email addressed being previously used.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Hydrographic Office (AHO)	8-06-2023	Email FROM relevant person	AHO replied to TGS' email sent 06/06/2023 confirming their records show only one cable exists within the OA.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Hydrographic Office (AHO)	8-06-2023	Email TO relevant person	TGS replied to AHO's reply received earlier that day thanking them for providing confirmation there is only one submarine cable.	N	N/A	* (see note above table)	Continuing consultation.
Australian Institute of Marine Science (AIMS)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Institute of Marine Science (AIMS)	17-04-2023	Email TO relevant person	TGS emailed AIMS to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked AIMS to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Institute of Marine Science (AIMS)	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	22-12-2022	Email FROM relevant person	The relevant person provided a consultation letter with the following key points: - Summarised TGS' legal consultation requirements; - Proponent has not contacted AMCS and had to contact proponent direct; - Concerned TGS does not undrestand the extent to which their interests, functions and activities may be affected; - Details of how the project may affect their functions, interest and activity; - Encourage TGS to reflect on the consultation regime purpose which benefits TGS and the environment by improving the EP; and - Interested in receiving information to comment on.	Y - Consultation letter	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Marine Conservation Society	4-01-2023	Email TO relevant person	TGS acknowledged letter and apologised for delay in responding. TGS advised the EP area is being modified and will send out an updated information sheet once modifications had been made. TGS also advised they would welcome a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	15-02-2023	Email TO relevant person	TGS reconnected with AMCS to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	24-03-2023	Email FROM relevant person	AMCS emailed TGS following up from recent community consultation where questions were raised as to whether SLB is still involved with this project. AMCS would also like further information on who will be preparing the environmental report for the seismic testing proposed and their qualifications pertaining to marine habitat and wildlife of the Otway basin.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Marine Conservation Society	31-03-2023	Email TO relevant person	TGS replied to AMCS' email dated 24/03/2023 requesting further information about the proposed survey. TGS confirmed the following in summary: - SLB is involved with the project although TGS is leading the acquisition; and - SLR is preparing the EP. TGS then elaborated on their history with SLR and SLR's experience. TGS closed the email by thanking AMCS for their time.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	27-04-2023	Email FROM relevant person	AMCS replied to TGS' response emailed 31/03/2023 thanking TGS for clarification. AMCS asked if there up and coming consultation processes TGS can advise of. AMCS added that given the history of seismic testing across the Bonney Upwelling and Zeehan Marine protected area undertaken in 2019, AMCS is interested in the proposals for these areas as they intersect multiple areas of concern for marine and EPBC species.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Marine Conservation Society	2-05-2023	Email FROM relevant person	AMCS sent another email following their email received 27/04/2023 clarifying their query was regarding the Otway proposal for TGS and SLB.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Marine Conservation Society	5-05-2023	Email TO relevant person	TGS replied to AMCS' emails 27/04/2023 and 02/05/2023 thanking them for their message. TGS advised they have been working on a reply but suggested an online meeting to discuss their queries directly. TGS continued they can provide an overview of the proposed survey, consultation process and explain how they are developing the environmental plan (EP). TGS said they would like to ensure they have sufficient information to make an informed decision on how the proposed survey may impact their functions, interests and activities and then discuss any queries or concerns AMCS has to make sure TGS is addressing them within the survey planning and EP. TGS asked AMCS to provide a suitable date and time to meet and they can arrange a meeting invite. TGS closed their email thanking AMCS for their patience advising their EP is constantly changing as they receive new information during their consultation program which is causing some delay with a draft EP and responses to their stakeholders. TGS attached the information sheet to their email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	25-05-2023	Email TO relevant person	TGS emailed AMCS to see if they received TGS' email sent 05/05/2023 regarding a meeting to discuss their concerns with TGS' proposed marine seismic survey. TGS said they want to ensure they are providing AMCS sufficient opportunity to discuss AMCS' concerns and for TGS to provide an overview of their project. TGS continued they want to better understand AMCS' functions, interests and activities and how they can address AMCS' concerns going forward. TGS advised AMCS they are planning on submitting their EP to NOPSEMA for their completeness check soon and would like to include further feedback from AMCS in to their survey planning before then. TGS also noted the public consultation period and opportunity to provide feedback then. TGS asked AMCS if they provide a date and time when they could meet.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	25-05-2023	Email FROM relevant person	Automated reply from AMCS advising they are not checking their emails regularly to please call if urgent.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Marine Conservation Society	29-05-2023	Email FROM relevant person	AMCS replied to TGS' email sent 25/05/2023 regarding the proposed marine seismic survey. AMCS advised they have been looking for information that would help prepare for a meeting with TGS. AMCS asked for TGS to provide the following information: - existing seismic data for the proposed area from the past 15 odd years of seismic operations in the basin, and what the reason is for needing to again conduct seismic surveys. - the projected cumulative impacts of seismic surveys in this proposal are with the historical seismic operation on key Rare, Threatened and Endangered Species including the southern right whale, and blue whale. - commitments on how TGS will reduce the damaging impact to the marine environment and wildlife. AMCS closed their email saying they would like to arrange a meeting within 5 working days of receiving the information from TGS to provide them sufficient time to understand information and provide feedback.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Marine Conservation Society	1-06-2023	Email TO relevant person	TGS replied to AMCS' email received 29/05/2023 addressing their queries within that email with the following summarised information: - Reason for survey is to provide subsurface geology to multiple resource companies for to interpret and determine the potential resource availability (usually for oil and gas). - TGS is a data acquisition company and survey and environment plan purpose is to acquire data about the area - the project is not for extraction or drilling. - EP contains detatiled information about the controls and commitments TGS will implement to avoid and minimise impacts to the marine environment. - TGS could explain the EP process in a meeting and then encourage them to review it once NOPSEMA accept as complete and release it for public consultation. TGS then provided examples of some of the comittments they will be implementing to avoid or minimise acoustic disturbance on blue whales and southern right whales. TGS closed their email by thanking AMCS for their ongoing queries as highlights the community's concerns and what they need to do to address them in their survey planning. TGS asked AMCS to advise a date and time that would suit to meet and discuss further.	Y - Maps showing past 15 years of 2D and 3D seismic surveys	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	2-06-2023	Email FROM relevant person	AMCS replied to TGS' email thanking them for their information and asked TGS to supply the environmental plan they refer to, to help AMCS understand any references TGS would make at a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	7-06-2023	Email FROM relevant person	AMCS emailed TGS seeking clarification on whether TGS/SLB has pulled out of proposed community consultations and why TGS is not progressing with these community consultation events.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	8-06-2023	Email TO relevant person	TGS replied to AMCS' email received 07/06/2023 thanking them for their email and queries regarding community consultation. TGS confirmed they have cancelled and declined invitations to attend three community organised events advising they don't feel their attendance would be appropriate and have offered an online meeting as an alternative. TGS advised their environmental plan is currently being drafted and will be provided to NOPSEMA for a completion check and once accepted as complete will be widely available for public consultation. TGS closed the email asking AMCS to advise if they would like to proceed with an online meeting with suitable dates and time to arrange an invite.	N	N/A	* (see note above table)	Continuing consultation.
Australian Marine Conservation Society	8-06-2023	Email FROM relevant person	AMCS replied to TGS' email sent earlier that day thanking TGS for confirming TGS is removing themselves from public consultation processes. AMCS added they are concerned TGS is attempting to fast track the development of the environment plan to send to NOPSEMA, limiting opportunities for informed consultation for AMCS or concerned communities seeking public consulation processes. AMCS explained TGS' barrier to meaningful consultation and are interested to know whether SLB is proposing to join online consultation with limited and select parties now that TGS has refused public consultation processes.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Australian Marine Conservation Society	9-06-2023	Email TO relevant person	TGS replied to AMCS' email received the day before advising the following: - TGS is not removing themselves from or refusing public consultation processes. - The document AMCS requested is not yet complete so can't provide them a copy yet, however have provided extracts (previous email). - TGS is not trying to fast track the EP development (has been a work in progress since 2021). - SLB has attended most (98%) of online or in-person meetings and likely to be present at any future meetings. TGS explained their understanding of meaningful consultation and the remaining process for developing the EP including submitting to NOPSEMA for their initial completion check, followed by public consultation and TGS reviewing the EP to incorporating any relevant submissions - demonstrating the opportunities for AMCS and concerned communities to seek informed or public consultation. TGS also attached NOPSEMA's guidelines for providing feedback on environmental plan and asked AMCS to let them know if they'd like to proceed with an online meeting. TGS closed the email suggesting they can wait until the public consultation period as an alternative.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Australian Marine Conservation Society	15-06-2023	Email FROM relevant person	AMSC replied to TGS' email sent 09/06/2023 with the following queries: - map of 2D and 3D acquisition within AA over last 15 years; - clarification if this project is being sought under SPA or other permit; - what changes in practices will take place in light of the current investigations into previous breaches by SLB; - a map showing the changes in proposed boundaries are in the latest EP for seismic operations; - details on what if any of those changes are due to BIA data of the proposed location; - information on what measures SLB/TGS be putting in place for mammal observations by way of extra staff, vessels, aircraft or time frame constraints; - what does SLB/TGS propose as their public consultation process should the EP be accepted by NOPSEMA in light of SLB/TGS declining recent community consultation sessions; - what specific issues are SLB/TGS pointing to as reasons for declining community consultation sessions; and - what changes in practices is SLB/TGS making to work plans based on feedback from Traditional Owners in the region on impact to cultural heritage, with a focus on southern right whale.	N	N/A	* (see note above table)	Continuing consultation.
Australian Maritime Safety Authority (AMSA)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Australian Maritime Safety Authority (AMSA)	01-06-2022	Email FROM relevant person	Stakeholder asked that timely and relevant Maritime Safety Information (MSI) is promulgated for the area and nature of operations through 3 steps. 1. Contact the Australian Hydrographic Office no less than four weeks before operations, with details relevant to the operations. 2. Notify AMSA's Joint Rescue Coordination Centre (JRCC) by e-mail or phone for promulgation of radio-navigation warnings at least 24-48 hours before operations commence. 3. Plan to provide updates to both the Australian Hydrographic Office and the JRCC on progress and, importantly, any changes to the intended operations. The stakeholder advised that to obtain a vessel traffic plot showing Automatic Identification System (AIS) traffic data for the area of interest, please visit AMSA's spatial data gateway and Spatial@AMSA portal to download digital data sets and maps. A form for requesting customised information and data is also available via the portal (fees may apply).	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Maritime Safety Authority (AMSA)	10-06-2022	Email FROM relevant person	AMSA communicated that the Nautical Advice Inbox is no longer monitored, and provided TGS/Schlumberger/ERM with the preferred contact email for all future communications regarding the proposal.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Maritime Safety Authority (AMSA)	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked AMSA for the update to their details.	N	N/A	* (see note above table)	Continuing consultation.
Australian Maritime Safety Authority (AMSA)	30-06-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for providing the survey information. They noted that the survey area is an area where vessels converge as they travel to and from along traffic routes between WA, SA, TAS, Victoria, NSW and New Zealand. The stakeholder highlighted that before a survey, the vessel is required to notify AMSA's Rescue Centre (ARC) for promulgation of radio-navigation warnings 24-48 hours before operations commence. In addition, the Australian Hydrographic Office is to be contacted no less than four working weeks before operations commence for the promulgation of related notices to mariners. The stakeholder encouraged TGS/Schlumberger to visit AMSA's spatial data gateway and Spatial@AMSA portal to download digital data sets and maps in the future. They also communicated that a form for requesting customised information and data is available via the Spatial@AMSA portal.	Y - Vessel traffic plot for area of interest.	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Maritime Safety Authority (AMSA)	15-02-2023	Email FROM relevant person	Reply email from AMSA advising had replied the previous day requesting the ESRI ArcGIS shapefile information so the GIS team can overlay the AIS data for analysis.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Maritime Safety Authority (AMSA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Maritime Safety Authority (AMSA)	15-02-2023	Email TO relevant person	TGS replied to previous email providing the shapefile data requested within the previous email.	Y - Shapefile data as requested	N/A	* (see note above table)	Continuing consultation.
Australian Maritime Safety Authority (AMSA)	20-02-2023	Email FROM relevant person	Response email from AMSA advising the requirement for timely and relevant Maritime Safety Information (MSI) to be promulgated for the area and nature of operations by: 1. Contacting the AHO no less than 4 weeks prior to operations whom will send out Notice to Mariners; 2. Notifying AMSA's JRCC at least 24-48 hrs prior to operations; and 3. Planning to provide updates to AHO and JRCC on progress and any changes to operations.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Recreational Fishing Foundation (ARFF)	19-05-2023	Email TO relevant person	TGS emailed ARFF seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from ARFF to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked ARFF to reply before 26/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Recreational Fishing Foundation (ARFF)	20-05-2023	Email FROM relevant person	Automated reply advising email sent to ARFF the day before was underliverable.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Recreational Fishing Foundation (ARFF)	25-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 31/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	13-05-2022	Email TO relevant person	TGS state they are contacting ASBTIA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of the Commonwealth fisheries	N/A	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	26-05-2022	Email FROM relevant person	ASBTIA thanked TGS/Schlumberger for making contact and acknowledged receiving the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS. ASBTIA confirmed that active fishing takes place in the area covered by the proposed survey, and that this fishing activity is highly seasonal - taking place in the austral summer and autumn. The stakeholder recognised historic communications with both TGS and Schlumberger on similar projects, and indicated a desire to work through the potential impacts of the current survey.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	31-05-2022	Email TO relevant person	TGS thanks ASBTIA for their reply and informs them that they have just sent out an invite for a briefing call to which ASBTIA are invited, other sessions, or aseperate meeting will be available should ASBTIA not be able to attend.	N	N/A	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited AFMA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	02-06-2022	Meeting with relevant person	TGS/Schlumberger/ERM presented an overview of the survey, and of the commercial fishing effort for relevant Commonwealth and State managed fisheries based on available data. The stakeholder questioned if the survey effort will be focused on where acreage has been released. TGS/Schlumberger confirmed this is the case. The EP will seek approval for the full 3D Active Source Area, but acquisition will be phased according to acreage release, among other factors. ASBTIA also raised concerns regarding impacts to pelagic resources. The Murray Marine Park is closed to the SBTF for 2 years, is subject to temporal closures and has a small area to fish. The stakeholder requested TGS/Schlumberger avoid surveying between December and March. The stakeholder had questions regarding the timing and phasing of areas of acquisition under the EP. TGS explained that waters towards Tasmania and Victoria are in the current acreage release that is awaiting announcement and that areas in the south-eastern half of the survey area were most likely to attract interest first. There is no current acreage release proposed for South Australia, but there is likely to be in the coming years. TGS/Schlumberger pointed out that the fishing industry also has the opportunity to comment on future acreage releases through NOPTA. ASBTIA noted that they require a condition to be included in petroleum licences such that petroleum activities must not affect the migration of Bluefin tuna, which needs to be considered for this activity. TGS/Schlumberger confirmed they would like to schedule a targeted meeting with ASBTIA to discuss. TGS / Schlumberger sought the groups' suggestions on best approach for ongoing engagement, whether it be with each organisation separately or if they wanted to nominate a main representative. Attendees suggested ongoing consultation with each industry association.	N	Stakeholder has raised an objection, claim or concern. The objection or claim is addressed in the EP. Request to avoid acquisition December-March included in ALARP assessment in the EP. Not considered practicable given that December to March is likely to provide the most favourable weather and sea conditions, and impacts to SBT are not considered to be significant. Localised voidance by SBT is most likely impact. Potential for activity to affect the migration of SBT is assessed in the EP. Given the limited sensitivity of tuna to sound pressure, behavioural effects will be localised. Evidence from previous studies, plus steady historical SBT catch rates in the GAB and Tasman Sea, indicate that SBT migration continues regardless of past seismic surveys.	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	03-06-2022	Email TO relevant person	TGS/Schlumberger invited ASBTIA to a briefing call on Friday June 10th with other fishing stakeholders.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	10-06-2022	Email FROM relevant person	ASBTIA apologised for not responding to the meeting invitation for June 10th and noted that it must have been accidentally deleted. They highlighted that the survey represents an important issue for them.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholders for their attendance and participation in the meeting on June 2nd. TGS/Schlumberger highlighted that the attached 2019 report includes a summary of the proportion of historical catch in each fishery that was overlapped by that survey area, and that the current Otway Basin 3D MSS area is similar. TGS/Schlumberger also noted that the stakeholder from SETFIA pointed out there are areas where overlap is expected to be significantly reduced. TGS and Schlumberger informed the stakeholders that they have engaged SETFIA to compile similar information for the Otway Basin 3D MSS.	Y - Summary meeting notes - Copy of the 2019 Schlumberger Otway 2D Seismic Survey report prepared by SETFIA	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	17-06-2022	Email TO relevant person	TGS/Schlumberger offered to organise a call between TGS/Schlumberger/ERM and ASBTIA to discuss issues specifically relating to Southern Blue Fin Tuna fishing activities, and address any queries before ASBTIA finalises a response to the original email. TGS provided days that would suit for a meeting to be held.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	17-06-2022	Email FROM relevant person	Email undeliverable to one stakeholder email account.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	29-06-2022	Email TO relevant person	TGS/Schlumberger requested a meeting before ASBTIA submits a formal response, and advised that a representative would be in Adelaide during the week of the 4th of July and would be happy to arrange a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	29-06-2022	Text message TO relevant person	TGS advised the stakeholder that a representative would be in Adelaide the week of the 4th of July and requested a meeting with ASBTIA.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	29-06-2022	Meeting with relevant person	ASBTIA joined at the end of the call to provide an update on the status of ASBTIA's response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	30-06-2022	Text message FROM relevant person	ASBTIA explained that they would be away for the first half of the week and would be available for a meeting on either the 7th or 8th of July.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	30-06-2022	Text message TO relevant person	TGS agreed to a meeting on the 7th July and asked the stakeholder to give options for a suitable time.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	06-07-2022	Text message FROM relevant person	The stakeholder suggested 10:00 am as a suitable meeting time and the CBD or surrounds as a meeting place.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	06-07-2022	Text message TO relevant person	TGS agreed to 10:00 am and suggested a location for the meeting.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	06-07-2022	Text message FROM relevant person	The stakeholder accepted this location.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	07-07-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for the meeting discussion and have the following follow-up details from ASBTIA's perspective. (1)To re-emphasise – ASBTIA are resource utilisation and evidence-driven people, but the proposed area is a major problem. (2)ASBTIA will follow up the catch data. (3)ASBTIA understand the SA acreage release – and will confirm the actual timetable tomorrow. (4)ASBTIA understand that the EP may aim at acquiring data in the southern area from Q1 2023. (5)TGS/Schlumberger are aiming to get the EP to NOPSEMA around August 2022. (6)TGS/Schlumberger would like to investigate joint spotting for Blue Whales. (7)As ASBTIA raised, attached are the Conditions covering tuna from a PGS approval.	Y - Conditions covering tuna from a PGS approval	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	07-07-2022	Text message TO relevant person	TGS notified the stakeholder that a representative from Schlumberger would also be attending the meeting.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	07-07-2022	Text message FROM relevant person	The stakeholder acknowledged this and agreed.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	29-07-2022	Email TO relevant person	TGS/Schlumberger confirmed that acquisition in the south-eastern part of the EP area is most likely to commence first with the north-western section dependant on acreage release and interest from title holders. TGS/Schlumberger went on to outline both the standard communications protocol, and specific southern bluefin tuna protocol (SBTF Assessment Area) to reduce impacts to fishers. It was also noted that observers on boats and in aircraft will record aggregations of tuna and share sightings data with the stakeholder daily. TGS/Schlumberger also requested that ASBTIA share marine mammal sightings data with them to supplement observations during the survey.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	10-08-2022	Email TO relevant person	TGS emailed ASBTIA regarding invoicing from ASBTIA.	N	N/A	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	15-02-2023	Email TO relevant person	Reply email to ASBTIA acknowledging their previous email.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	15-02-2023	Email FROM relevant person	ASBTIA acknowledge previous email provided by TGS and advised they will respond prior to date specified.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	22-03-2023	Email TO relevant person	TGS followed up previous email sent ASBTIA on 15/02/2023 advising TGS is happy to set up a meeting with ASBTIA if they would like to discuss further.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	22-03-2023	Email TO relevant person	TGS replied to ASBTIA's previous email sent earlier that day, providing requested boundary co-ordinates data for revised area.	Y - Shape files of boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	22-03-2023	Email FROM relevant person	ASBTIA replied to TGS previous email sent earlier in the day apologising for not replying advising they are exceptionally busy and understaffed. ASBTIA asked TGS to forward the boundary co-ordinates for the revised area (DDM in Excel preferred although can deal with shape files if that is the format TGS has).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	4-04-2023	Email FROM relevant person	ASBTIA emailed TGS to advise that while the revised scope is welcomed, the proposed survey remains a significant concern for SBT and they remain opposed to the activity and will outline their concerns in formal correspondence. ASBTIA requested TGS to provide detail on how the survey will meet the newly passed SafeGuards mechanism and the interaction and data sharing arrangements between the TGS survey and the CGG Reggia survey.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	13-04-2023	Email TO relevant person	TGS replied to ASBTIA's email received 04/04/2023, acknowledging their email and their concerns. TGS said they would like to work with them to try to reduce some of their concerns and look forward to their formal correspondence to further discuss each of their concerns. TGS explained they have been liaising with CGG regarding potential cumulative impacts regarding timing of surveys and at this stage the proposed active source areas are far enough apart that data sharing is not required or appropriate. TGS thanked ASBTIA for providing updated contact details.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	14-04-2023	Email TO relevant person	TGS emailed ASBTIA to provide them with an answer to their query regarding the SafeGuard Mechanism, advising this framework applies to fixed facilities with Scope 1 emissions of greater than 100,000 tonnes of CO_2 equivalent per year. TGS also commented that all TGS' emissions for all vessels did not reach that total in a year, let alone for a single survey.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	4-05-2023	Email TO relevant person	TGS emailed ASBTIA asking if they were available for a phone call either today or next week to discuss the survey and the concerns you have.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	10-05-2023	Email TO relevant person	TGS emailed ASBTIA advising they will be in Adelaide next week and would be great to catch up and asked if they would be available.	N	N/A	* (see note above table)	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	24-05-2023	Email TO relevant person	TGS emailed ASBTIA following up on unanswered emails sent 10/05/2023 and 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS provided the information sheet and stated that if ASBTIA has any input about their proposed survey to please let TGS know before 01/06/2023 that they can consider that additional information within the development of their environmental plan before submitting to NOPSEMA soon. TGS provided their contact details for if they would like further detail or have any questions.	N	N/A	* (see note above table)	Continuing consultation
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	31-05-2023	Email FROM relevant person	ASBTIA emailed TGS providing a formal submission on their proposed marine seismic survey. Comments from the submission are summarised below: - ASBTIA acknowledged the reduction in survey area which no longer overlaps with where fishing vessels operate. - Experience of long lasting consequences on migratory species from 3D marine seismic survey activities. - Behavioural changes and fishery displacement is not confined to the period the survey was operating, effects have impacted their fishery for a decade. - No indication the Great Australian Bight area has recovered [from previous survey actvity]. - Fish swim through the area of the previous survey area (2012-2015) and do not stop to feed. - The Bight including Otway is single most important feeding grounds for juvenile tuna and feeding area now reduced after previous survey. - Deep-sea canyons and deep ocean basin is critically important for adult SBT and displaced juveniles as they forage prior to their migration to the single spawing ground near Indonesia. - The proposed survey undermines international efforts to rebuild the SBT population. - There is no legitimate reason to subject the breeding population to undue stress. - ASBTIA suggested consulted Tuna Australia and the Commission for the Conservation of SBT. - ASBTIA can only accept a very small survey area to be developed within the next few years [to meet Australia's net zero carbon emissions committment]. ASBTIA closed their submission by advising they request that noise mitigation measures be implemented on the airgun array and that NOPSEMA impose noise control measures to confine elevated noise to within the EP area. Refer to Appendix H for detailed submission.	Y - Formal submission	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points raised by ASBTIA are discussed in the following sections of the EP: Southern Bluefin Tuna fisheries: **Section 7.1.3.1.1.6** (Southern Bluefin Tuna Fishery) regarding an assessment of the effects of the physical presence of the Seismic Survey; Aspects regarding recovery periods and previous surveys are addressed in **Section 9 Cumulative Effects**. Further to this, outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP. Ongoing consultation with ASBTIA will be undertaken in accordance with the methods set out in Section 5 to ensure ASBTIA have had both sufficient information, and sufficient time to engage in the consultation programme.	Continuing consultation.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	8-06-2023	Email TO relevant person	TGS replied to ASBTIA's email and formal submission received 31/05/2023 thanking ASBTIA for their time and letter. TGS advised ASBTIA they not their comments and concerns and advised they have been in contact with the relevant persons they suggested contacting. TGS also advised they are not planning on acquiring data from the entire acquisition area as there will be discrete surveys with the first phase likely to comprise of 6000 - 7000 km2 which is likely to take approximately 5 months (pending delays). TGS added there is also a maximum of 400 days acquisition over te 4 year period and a maximum of 200 days in any given year. TGS closed the email by inviting ASBTIA to contact them if they need additional information or have additional comments or would like to arrange a meeting to discuss their project further.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Bass Coast Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bass Coast Shire Council	16-02-2023	Email FROM relevant person	Automated reply from BCSC acknowledging receipt of email and advising will be in touch as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bass Coast Shire Council	17-04-2023	Email TO relevant person	TGS emailed BCSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked BCSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bass Coast Shire Council	17-04-2023	Email FROM relevant person	Automated reply from BCSC acknowledging receipt of email and advising will be in touch as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bass Coast Shire Council	4-05-2023	Phone call TO relevant person	SLB called BCSC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The BCSC representative could not find the email and asked the email to be resent with the addition of a contact name and number for them to contact TGS back. SLB confirmed they would resend the factsheet.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bass Coast Shire Council	8-05-2023	Email TO relevant person	TGS emailed BCSC to provide a copy of the existing emails sent to BCSC on 17/04/2023 and 16/02/2023 with the latest information sheet attached. TGS advised they would call over the next few days to check they had received and whether they had any queies or further information.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bass Coast Shire Council	8-05-2023	Email FROM relevant person	Automated reply from BCSC acknowledging receipt of email and advising will be in touch as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bass Coast Shire Council	9-05-2023	Email FROM relevant person	BSCS replied to TGS' email sent 08/05/2023 thanking TGS for contacting them and providing details about their proposed project. BSCS advised that based on the information provided, they are confident the project will not impact the functions, interests or activities of the Bass Coast Shire Council. BSCS closed their email advising they can be removed from their stakeholder further consultation list.	N	N/A - no impact on their functions, interests or activities - advised can be removed from consultation list.	N/A	Consultation closed
Bass Strait Scallop Industry Association	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Bass Strait Scallop Industry Association	31-05-2022	Email TO relevant person	TGS/Schlumberger invited the stakeholder to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Bass Strait Scallop Industry Association	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bass Strait Scallop Industry Association	17-04-2023	Email TO relevant person	TGS emailed BSSIA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked BSSIA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bass Strait Scallop Industry Association	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Beach Energy	01-06-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Beach Energy	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Beach Energy	15-02-2023	Email FROM relevant person	Automated reply to email address advising undeliverable to one stakeholder account.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Beach Energy	21-02-2023	Email TO relevant person	Forwarded email to an alternative email address for Beach to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/06/2022.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Beach Energy	22-02-2023	Email FROM relevant person	BE replied to TGS' email delivered 21/02/2023 providing information about the Otway Basin Marine Seismic Survey. BE asked TGS to provide shape files for the EP area and the Active Source Area and distances to sound exposure levels for TTS and behaviour for low frequency whales (blue, southern right whales).	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation.	* (see note above table)	No action required. Continuing consultation.
Beach Energy	24-02-2023	Email TO relevant person	TGS replied to BE's email received 22/02/2023 providing shape files and information relating to the sound exposure levels requested.	Y - Shape files and information relating to distances for sound exposure levels.	N/A	* (see note above table)	Continuing consultation.
Beach Patrol 3280	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Beach Patrol 3280	17-04-2023	Email TO relevant person	TGS emailed BP3280 to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked BP3280 to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Beach Patrol 3280	17-04-2023	Email FROM relevant person	Another BeachPatrol unit (BP3270) replied to TGS' email sent earlier that day. BP3270 advised they have forwarded to their Warrnambool group leaders to assess their interest and closed the email thanking TGS for their follow up email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Beach Patrol 3280	27-04-2023	Email FROM relevant person	BeachPatrol3280 emailed TGS regarding their proposed marine seismic survey advising the best contact details [as original email was distributed to an administrative BeachPatrol address]. BP3280 advised they operate out of Warrnambool and explained their main role is to collect marine debris along the beaches and want to be assured TGS activities will not result in increased rubbish washing up on beaches as the dominant form of rubbish BP3280 collects is from international shipping and fishing boats. BP3280 asked to see the survey's waste management plan and have assurances that TGS will commit to zero rubbish disposed at sea. BP3280 also advised they are concerned with fuel spillage as they collect balls of crude oil and asked if TGS how to dispose of them and whether TGS has a plan for their disposal. BP3280 also asked if TGS will carry out crude oil testing if they find crude oil washing up increases during TGS' activities. BP3280 concluded their email stating given their concern is protecting the natural environment and impacts that human activities have on marine life, they have great concerns about the impacts of seismic blasting on marine animals, particularly the Southern Right Whale who have a nursery in Warrnambool.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Aspects related to waste management are addressed in detail in **Section 7.3.** Control Measures specific for waste management are listed in **Table 90.** Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP. Aspects of the concerns related to crude oil are not in th scope of this EP.	Continuing consultation.
Beach Patrol 3280	27-04-2023	Email TO relevant person	TGS replied to an email received 17/04/2023 from another BeachPatrol unit (3270) advising TGS had received an email from BeachPatrol3280 so will liaise directly with them. TGS acknowledged their email the following day.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Beach Patrol 3280	3-05-2023	Email TO relevant person	TGS replied to BP3280's email received 27/05/2023. In summary, TGS thanked BP3280 for their email and raising their concerns and advised they have noted their email address and updated their consultation register. In summary, TGS replied with the following: - TGS is part of the Energeo Alliance Ghost Net and Marine Debris removal initiative. - TGS operates under strict regulatory requirements and will have a waste management plan (WMP) which will state the appropriate handling and disposal of waste (managed in accordance with relevant legislation). TGS provided some examples of waste management measures from the WMP. - TGS has made a committment to not have any discharges within the marine parks. - The survey vessel will be using marine gas oil confirming the survey will not result in crude oil reaching the beaches and therefore TGS would not cover crude oil testing as not from any activities TGS would be undertaking. - TGS is aware of the sensitivities in the area and control measures will be implemented to minimise any potential impacts on those sensitive receptors (examples included restrictions on the area where data can be acquired during important periods of the year for certain whales species, marine mammal observers, buffer zones, shutdown periods, aerial surveys). - Refuelling will take place offshore in accordance with strict operational procedures (examples provided). - Survey is a significant distance offshore and beyond the continental shelf edge, avoiding more sensitive near shore and continental shelf habitats. Refer to Appendix H for detailed submission.	N	N/A	* (see note above table)	Continuing consultation.
Beach Patrol 3280	30-05-2023	Email FROM relevant person	BP3280 emailed TGS with the following additional queries regarding their proposed marine seismic survey: - Will TGS be running any public consultation meetings in Warrnambool. - Who are the multi-clients. - Is the testing happening up to 200 days per year over several years. - Provide more specific details about where the testing is taking place. - Do you have an environmental plan they can view. - Are the other groups [names provided] carrying out seismic activities working with TGS or separately. - Clarification on who is who (regarding the other companies working in the area).	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised. Continuing consultation.	* (see note above table)	Continuing consultation.
Beach Patrol 3280	1-06-2023	Email TO relevant person	TGS replied to BP3280's email received the day before with the following summarised information: - Currently no community session planned for Warrnambool however TGS asked them to let them know if they want to meet and discuss their queries. TGS advised they plan to submit their environment plan (EP) to NOPSEMA mid-June and then once accepted as complete, NOPSEMA will make the EP available for public comment and will let you know when plan is available for public comment. - TGS can't confirm who the multi-clients will be and depends on who is interested in data. - TGS clarified the survey timing as maximum of 200 days per year with maximum 400 days between 2023 and 2027 (pending approval).TGS also corrected BP3820's use of 'surveying' rather than 'testing'. - TGS advised they can't be specific with acquisition area at this stage as depends on when works commence and avoiding sensititivities and will also depend on weather, and equipment/vessel availability. - TGS advised the EP will be available for review during the public consultation process. - TGS confirmed their proposed survey is indepedent of ConocoPhillips, Regia, Beach Energy and Cooper Energy's activities and accordingly cannot comment on their activities. TGS closed their email asking for BP3820 to contact them if they need any other information or would like to arrange a meeting. TGS provided a copy of the updated information sheet for their record.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	12-04-2023	Email TO relevant person	TGS emailed BLALC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback by 19/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	20-04-2023	Phone call TO relevant person	TGS emailed BLALC to follow up email sent 12/04/2023 but there was no response. TGS left a message to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	20-04-2023	Email TO relevant person	TGS emailed BLALC to follow up on email sent 12/04/2023 and phone call earlier that day. TGS explained they would really like to meet online with BLALC and those within their organisation that would be interested to hear about TGS' plans and hear any concerns BLALC may have. TGS suggested they could arrange an online meeting at their convenience to discuss. TGS closed the email thanking them.	N	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	1-05-2023	Phone call TO relevant person	TJ called BLALC regarding their proposed marine seismic survey within the Otway Basin and spoke with the receptionist who advised hadn't spoken with the CEO yet but suggested an alternative contact (project manager) as the best person to speak with. The receptionist asked TGS to email information through to their administration email address and said they would forward information and contact details to the project manager.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	1-05-2023	Email TO relevant person	TGS emailed BLALC following a phone call earlier that day. TGS asked if this email could be forwarded to another contact within BLALC, advising TGS would really like to meet online to discuss their proposed marine seismic survey within the Otway Basin. TGS included the information sheet.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	9-05-2023	Phone call TO relevant person	TGS called BLALC regarding their proposed marine seismic survey within the Otway Basin following a suggestion from another nearby Aboriginal land council but there was no answer. TGS left a message explaining the reason for their call and asked BLALC to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	11-05-2023	Phone call TO relevant person	TGS called the BLALC CEO regarding their proposed marine seismic survey within the Otway Basin. BLALC advised how to consult with their community which involves sending them an information flyer and they will distribute it to the community. BLALC continued that once the information was distributed to hold a community meeting where the community will decide if they wisht to attend or not. BLALC provided the appropriate email address to send the information flyer to.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	11-05-2023	Email TO relevant person	TGS emailed BLALC to follow up from phone call with BLACL earlier that day advising they had spoken with a BLALC contact whom asked TGS to forward an email to them to share the attached information sheet with their community. TGS asked what day would be best for a community engagement session at the Hub or whether there is an opportunity to present their project in an online forum.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	11-05-2023	Email TO relevant person	TGS replied to BLALC's email received earlier that day confirming TGS would like BLALC to forward their email and information to the BLALC community hub worker. TGS asked if the community hub worker could call TGS (mobile phone details provided) to confirm a date for a community meeting.	N	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	11-05-2023	Email FROM relevant person	BLALC responded to TGS' email sent earlier that day confirming they could circulate the information sheet. BLALC advised the appropriate contact for the community hub worker within BLALC who can help arrange the community engagement session and asked if TGS would like their email forwarded to them.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	22-05-2023	Phone call TO relevant person	TGS called BLALC to speak with the community hub worker about arrangement a meeting to discuss their proposed marine seismic survey with their community. BLALC advised the information sheet emailed 11/05/2023 has been posted in the BLALC social media group and confirmed a community meeting for 25/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	25-05-2023	Message FROM relevant person	BLALC advised they have sent an email to reschedule today's meeting and to please send through a date and time for a new meeting.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	25-05-2023	Message TO relevant person	TGS replied to BLALC's message received earlier that day asking to reschedule today's meeting. TGS asked if 30/05/2023 would be ok and advised they can do a flyer with that time if that would help.	N	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	25-05-2023	Email TO relevant person	TGS replied to BLALC's email received earlier that day advising no problem at all to reschedule their meeting and agreed with 30/05/2023. TGS attached a flyer about the meeting for them to distribute and advised they would send BLALC a meeting invite.	Y - Meeting flyer	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	25-05-2023	Email TO relevant person	TGS emailed online meeting invite to BLALC for 30/05/2023.	Y - Meeting flyer	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	25-05-2023	Email FROM relevant person	BLALC emailed TGS advising they have to reschedule today's meeting apologising for any inconvenience. BLALC asked if they could email through a date and time that suited.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	25-05-2023	Meeting with relevant person	TGS, SLB and SLR arranged a community meeting with BLALC but no one from BLALC arrived so the meeting was cancelled.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Local Aboriginal Land Council	30-05-2023	Meeting with relevant person	TGS, SLB and SLR met with BLALC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with BLALC: - waste discharge and treatment; - impacts to sensitive sites along coastline; - impacts to fauna and flora; - clarification of who NOPSEMA is and process for EP submission; and - aerial surveys. BLALC concluded meeting advising they thought TGS had it all covered and wil get in contact with other questions. TGS advised they would provide BLALC with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Waste discharge and treatment: **Section 7.3**, with control measures specific for waste management listed in **Table 90.** Impacts to sensitive sites along coastline: relevant spects relate to unplanned oil spill events that may reach near shore or shoreline areas. Specific aspects adressing sensitive sites are discussed in **Section 8.3.3.4**, with control measures listed in **Table 126**. Impacts to fauna and flora: various sensitive receptors are discussed in Section 7.2 (for acoustic impacts), **Section 7.3** (routine permissible waste discharge), **Section 7.4** (atmospheric emissions), **Section 7.5** (artificial light emissions), **Section 8.1** (IMS), **Section 8.2** (streamer loss), **Section 8.**3 (vessel collision and hydrocarbon spill), and **Section 8.5** (accidental release of hazardous and non-hazardous material). Aerial surveys: Control Measures for cetacean monitoring includes the use of period aeriall surveys (refer to **Table 87** and **88** for EPO and control measures for acoustic disturbance , and aerial surveys may also be a tool applied under any emergency OPEP response (**Section 10.10**).	Continuing consultation.
Bega Local Aboriginal Land Council	9-06-2023	Email TO relevant person	TGS emailed BLALC the minutes and a copy of the presentation from their meeting held on 30/06/2023 and asked BLALC to advise of any changes or text to be removed. TGS said they appreciate and respect BLALC's time and information and have incorporated their comments and queries within their environmental and consultation planning and will update their environmental plan to reflect the information provided. TGS asked if BLALC would like to keep updated with the survey progress and remain on their consultation list or prefer to be removed from the consultation program and to let them know either way.	Y - Meeting minutes and presentation	N/A	* (see note above table)	Continuing consultation.
Bega Local Aboriginal Land Council	12-06-2023	Email FROM relevant person	BLALC replied to TGS' email from 30/05/2023 thanking TGS for providing the meeting minutes. BLALC queried the engagement process as thought the connection with the community hub worker was to assist a process for meeting community members. BLALC asked TGS to send them information that explains the survey and potential impacts as a useful tool to circulate to their community.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Bega Valley Shire Council	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why BVSC was triggered as a potential relevant person as the area that may be affected overlaps with the southern NSW coast. TGS asked BVSC to adivise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bega Valley Shire Council	4-05-2023	Email FROM relevant person	Automated reply email acknowledging TGS' email sent earlier that day advising the email will be forwarded to the responsible area wihtin the Council for the attention and response as per the Council's Customer Service Policy.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bega Valley Shire Council	10-05-2023	Phone call TO relevant person	TGS called BVSC to follow up on an email TGS sent on 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin. The BVSC advised the environment group had looked at the information but did not consider the project relevant to them. TGS explained how they had identified the environment that may be affected (EMBA), which caused TGS to contact BVSC, however they reiterated that it was not relevant.	N	N/A - not considered relevant to them.	N/A	Consultation closed
Blue Whale Study Inc	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	18-05-2022	Email FROM relevant person	The email acknowledges that the Blue Whale Study Inc. received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS. The stakeholder noted that they have studied Pygmy Blue Whales (PBWs) in the survey region since 1998, and most sightings of PGWs are made on the continental shelf. The stakeholder acknowledged that the 3D survey appears to be planned to avoid shelf waters, which would minimise disturbance to foraging PGWs in that area. However they advised that research has determined the Presence of PBWs south of the shelf area (within the survey area). They attached 2 papers which note the Presence of PBWs within the survey area during the summer foraging season. However it was noted that the area is poorly understood due to its remoteness. The stakeholder requested more information in regards to PBW sightings during a 2D survey of the region in 2019-20.	Y - 2 scientific papers relating to the detection and distribution of Pygmy Blue Whales	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	20-05-2022	Email TO relevant person	TGS/Schlumberger thanked BWS Inc. for bringing the two scientific papers to their attention, and noted that the EP does look at the presence of PBWs in deeper waters. It was advised that TGS/Schlumberger would investigate the query regarding sightings during the 2D survey and provide further information to BWS Inc. the following week.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	02-06-2022	Email TO relevant person	TGS/Schlumberger attached a report extraction from the Schlumberger Otway 2D regarding mammal detections with data tables and map. TGS/Schlumberger also asked the Blue Whale Study Inc. what the status is of their annual aerial surveys in this region- If they are going ahead each year and what period do they typically cover.	Y - Report extraction from the Schlumberger Otway 2D	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	05-06-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for the information and suggested that they may soon have more queries. They advised that aerial surveys ideally cover the period between November and May, depending on available funding.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	5-06-2022	Email FROM relevant person	BWS thanked TGS for information sent regarding the Schlumberger Otway 2D and mammal detections.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	15-06-2022	Email FROM relevant person	The stakeholder requested positions and dates of the blue whale sightings as referenced in the previously attached report on June 2nd. They explained that this information would better help them understand the distribution of Blue Whales in the region and how they move between shelf and offshore areas.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	23-06-2022	Email TO relevant person	TGS/Schlumberger attached Blue Whale sightings data from the 2020 Otway 2D seismic survey with the dates and positions included. TGS/Schlumberger asked if the stakeholder could provide more information regarding the timing and frequency of surveys in the area over the next few seasons.	Y-PBW data attached including dates and positions	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	24-06-2022	Email FROM relevant person	BWS Inc. thanked TGS/Schlumberger for sending through the data, but identified that latitudes were missing from vessel 2 sightings records. They asked if these could also be sent through and noted that they will respond shortly with the information TGS/Schlumberger requested on survey details.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	24-06-2022	Email TO relevant person	TGS/Schlumberger attached the blue whale sighting data which included the missing records.	Y - Blue Whale Sighting Data excel sheet from the 2019 2D Survey	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	29-06-2022	Email FROM relevant person	The stakeholder asked for an update on the missing records and if these had been located.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	29-06-2022	Email FROM relevant person	BWS thanked TGS for providing the missing latitudes.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	29-06-2022	Email FROM relevant person	BWS asked TGS if they had located the missing latitudes.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	29-06-2022	Email TO relevant person	TGS/Schlumberger attached the blue whale sighting data which included the missing records.	Y - Blue Whale Sighting Data excel sheet from the 2019 2D Survey	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	30-06-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for sending through the 2020 seismic survey data. A letter response to the survey was attached detailing the interests and potential affects for the stakeholder.	Y - Letter outlining Blue Whale Study's interest in the survey and the potential effects.	Stakeholder has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP. Stakeholder identified the significance of PBWs utilising deep offshore waters in the STC. This information is captured in the EP and impact assessment.	* (see note above table)	Continuing consultation
Blue Whale Study Inc	13-07-2022	Email TO relevant person	TGS/Schlumberger thanked BWS Inc. for their letter response, and attached the MMO/PAM report from the Otway MC2D campaign as requested by the stakeholder. TGS acknowledged the comment from the stakeholder regarding Blue Whale foraging in deeper waters, and confirmed that the EP does consider foraging in the deeper water areas. TGS explained that the EP will assess the potential impacts to blue whales from sound propagating into the BIAs, and also potential impacts to foraging animals outside of the BIAs. A range of management options are currently being considered.	Y - MMO/PAM report from their Otway MC2D campaign in 2019-20	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	16-07-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for sending through the MMO report, and noted the comments which referred to possible effects on blue whales outside the BIA. The stakeholder expressed interest in understanding the management strategy options that would be put forward, and whether BW monitoring would be undertaken prior to or during the proposed survey.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	01-08-2022	Email TO relevant person	TGS/Schlumberger sent through the requested shapefile to the stakeholder. It was communicated that the details of the marine fauna observations and management strategy are still being decided. TGS/Schlumberger explained that there is an intention to include aerial surveys and marine fauna observers as part of this strategy. TGS/Schlumberger expressed a desire to share data and asked the stakeholder if they would be open to sharing their sightings data during the survey. TGS/Schlumberger explained that they are happy to call and discuss further with the stakeholder.	Y - Shapefile of project area	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	01-08-2022	Email FROM relevant person	The stakeholder requested a shapefile of the project area.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	02-08-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for sending through the shapefiles. The stakeholder strongly recommended that aerial surveys form part of the marine mammal management strategy. They explained that due to limited resources, their surveys take place mostly in the shelf and upper slope waters. The stakeholder explained that if TGS/Schlumberger wanted full coverage of the survey area, then longer-range surveys and specialised aircraft would be required. The stakeholder explained that they would be able to conduct these longer range surveys on a consulting basis, and would then provide all the data to TGS/Schlumberger.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	10-08-2022	Email TO relevant person	TGS/Schlumberger apologised for their slow reply and explained that they would appreciate discussing aerial survey options and data sharing. It is not anticipated that that long-range aerial surveys would be conducted over the entire area. However, TGS/Schlumberger explained that they would be open to discuss this, and inquired as to a convenient time for the stakeholder to have this discussion.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	11-08-2022	Email TO relevant person	TGS/Schlumberger advised that the proposed time would not work, and proposed a new day as Monday August 15th.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	11-08-2022	Email FROM relevant person	The stakeholder advised they would be available for a call between 10-11 am on the 12th of August.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	12-08-2022	Email FROM relevant person	The stakeholder accepted this option, and provided 08:30 am AWST as a potential starting time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	15-08-2022	Meeting with relevant person	The stakeholder explained that their aerial survey effort over the last ~20 years has been focussed on the continental shelf due to likely foraging associated with the Bonney Upwelling system and other upwelling systems. However, there is an increasing amount of evidence to support that the Subtropical Convergence (STC) offshore in deep waters is also significant for the blue whales. The stakeholder detailed research that suggest Blue Whale activity in areas south of the EP area. The stakeholder suggested TGS/Schlumberger could contract BWS to conduct aerial surveys over the PBW BIA and further offshore in the EP Area to detect blue whales for the purposes of mitigating impacts from the MSS.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised. Engagement with stakeholder regarding aerial surveys is continuing.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	24-08-2022	Email TO relevant person	TGS/Schlumberger explained that they still intend to prioritise aerial survey effort over the defined foraging BIAs (plus some additional buffer offshore to account for sound propagation from offshore activities towards the BIAs). TGS/Schlumberger expressed a desire to continue discussions with the stakeholder surrounding engaging them to undertake the aerial surveys, following an assessment of the EP by NOPSEMA.	Y - Meeting notes from 15/08/2022	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	30-08-2022	Email FROM relevant person	The stakeholder agreed to continued discussion regarding aerial surveys, and questioned when NOPSEMA's first round of assessment would be complete.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	31-08-2022	Email TO relevant person	TGS/Schlumberger explained that NOPSEMA's first round assessment is expected to be completed in early November.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Blue Whale Study Inc	1-09-2022	Email FROM relevant person	Request from BWS to use their formal email rather than their informal email, which they had inadvertently used in their previous correspondence.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	01-09-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for the information.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	1-09-2022	Email TO relevant person	Acknowledgement of formal email to use when corresponding.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	14-09-2022	Email FROM relevant person	The stakeholder attached a letter outlining some questions about proposed mitigation methods for Blue Whales, and requested a copy of the EP.	Y - Blue Whale Study Letter to TGS/Schlumberger DRAFT	Stakeholder has provided information and/or requested additional information.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	19-12-2022	Email FROM relevant person	BWS reconnected with TGS as had not heard from them or seen an EP on NOPSEMA website and asked if they were interested in engaging with BWS to do aerial surveys during the current upwelling season.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	4-01-2023	Email TO relevant person	TGS replied to BWS previous email apologising for delay and confirming they would still like to talk with them. TGS also advised they plan on resubmitting EP end of Feb but looking at modifications and would be in touch soon.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	8-02-2023	Email FROM relevant person	BWS acknowledged TGS' previous email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	13-02-2023	Email TO relevant person	TGS emailed BWS updated information sheet and advised would be good to catch up over next few weeks to continue discussion.	Y - updated information sheet	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	18-02-2023	Email FROM relevant person	BWS note significant reduction in the survey area, however their interests are still likely to be affected by operations and they would be happy to discuss over the next few weeks and asked if there was a preferred time.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	20-02-2023	Email FROM relevant person	BWS responded to previous email suggesting a meeting date and time of Wednesday 22/02/2023 at 10:30 EST with TGS.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	20-02-2023	Email TO relevant person	TGS suggested a meeting time later this week between 10:30 - 2:00 pm and asked BWS to confirm a time. TGS also advised SLR area assisting with EP and they would be attending also.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	21-02-2023	Email TO relevant person	TGS responded to BWS' suggested meeting date and time of 22/02/2023 at 10:30 am EST and asked if 11:00 am EST would be possible to meet with BWS.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	21-02-2023	Email FROM relevant person	BWS confirmed at meeting date and time of 22/02/2023 at 11:00 am EST with TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	22-02-2023	Meeting with relevant person	TGS provided BWS with an update on the revised survey including a reduced operational area (OA) and updated factsheet prior to the meeting. BWS enquired why the OA was reduced. TGS explained the initial area was large and permits had not been released across the larger area. BWS asked about the survey timing (commencement and duration) and TGS responded ideally Q4 2023 pending EP approval and first phase would take approximately 3-4 months. The group then had an open discussion about the survey (timing, control measures likely to be implemented etc). SLR advised they will develop a summary document that details all of the proposed control measures for marine mammals and provide to BWS for review and feedback. BWS confirmed the aerial survey aircraft company can fly to survey area and can be used to identify hot spots (based on upwelling of krill) potentially informing where whales may appear. BWS advised that blue whales are likely to be feeding in the area based on previous surveys and are keen to be involved with TGS aerial surveys. The group agreed another meeting will be convened following the distribution of proposed control measures to discuss and confirm final control measures to be included within the EP. BWS advised the IA framework for threatened species is under reveiw and based on offshore whale sightings, the current Otway Basin BIA is likely to be further extended offshore.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	22-02-2023	Email TO relevant person	TGS forwarded a meeting invite to BWS for 22/02/2023 at 13:00 hrs to discuss the proposed survey.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	4-04-2023	Email TO relevant person	TGS emailed BWS to advise they were still working on the PBW mitigation measures and once a draft was ready, they would sent to BWS and appreciate another meeting to discuss. TGS advised they would be in touch shortly.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	5-04-2023	Email FROM relevant person	BWS replied to TGS' email sent the previous day providing an update on progress with drafting marine mammal mitigation measures. BWS advised to get in touch when ready.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	20-04-2023	Email FROM relevant person	BWS emailed TGS advising the following summarised information: - the Commonwealth has initiated a review of the Biologically Important Areas for threatened marine species including blue whales, including nominations for new areas of interest (submission to DCCEEW by 28/04/2023). - BWS appreciate TGS-SLB sharing blue whale sighting data from aerial survey in 2020. [Comments were provided about blue whale behaviour etc]. BWS would like to know if TGS/SLB intend to contribute to the BIA process and if not, BWS feel it is their duty to nominate the area using the TGS-SLB data which was freely provided. BWS commented they realise this is a difficult issue for TGS-SLB due to their proposed operations in the area but commented this is an iconic endangered species and a rare opportunity to redefine critical aspects of their distribution and ecology. Refer to Appendix H for the detailed submission.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Aspects related to the claims about BIA and marine mammals are discussed in detail in the following sections of the EP: **Section 4.4.4** (Existing environment and BIAs), and **Section 4.5.6** (Marine mammals). Remaining concerns will be subject to ongoing consultation. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Blue Whale Study Inc	21-04-2023	Email TO relevant person	TGS replied to BWS' email sent the day before advising the data acquired in the 2019/2020 in the Otway was an SLB survey that TGS was not involved with. TGS included SLB recipients in the email and advised SLB can respond.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	2-05-2023	Email TO relevant person	TGS emailed BWS to provide them with a draft summary of the proposed marine mammal control measures for them to review. TGS closed the email requesting a meeting with BWS the following week if they are available.	Y - Proposed marine mammal control measures	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	2-05-2023	Email TO relevant person	TGS replied to BWS' email received earlier that day and suggested a meeting for either the Wednesday or Friday the following week and asked BWS to confirm which date and a time would best suit them and TGS will set up the meeting.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	2-05-2023	Email FROM relevant person	BWS replied to TGS' email sent the previous day providing a draft summary of the proposed marine mammal control measures, thanking TGS for sending that through. BWS said they will check their availability for a meeting next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	3-05-2023	Email FROM relevant person	BWS replied to TGS' email sent the previous day suggesting a meeting date and advised Wednesday morning would be best.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	4-05-2023	Email TO relevant person	TGS emailed BWS a meeting invite for 10/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	5-05-2023	Email TO relevant person	SLB emailed BWS apologising for the delay in their response to their email received 21/05/2023 regarding the cetacean sighting data acquired during the 2019/2020 Otway 2D survey. SLB confirmed that when requested, SLB provided the data to BWS to give them access to a better understanding of the blue whale population and movement in the area and confirmed SLB is happy for BWS to use going forward. SLB confirmed they would not be participating in the BIA process for reasons outlined within BWS email from 20/04/2023.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	10-05-2023	Email FROM relevant person	BWS emailed TGS providing feedback on the information provided to them for review in email sent from TGS 02/05/2023 of which they discussed during their meeting earlier that day. BWS advised they would work on the scoping document for the aerial surveys.	Y - Feedback on proposed marine mammal control measures and image	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Blue Whale Study Inc	10-05-2023	Meeting with relevant person	TGS, SLR. BWS and RPS met to discuss marine mammal control measures for the proposed marine seismic survey. Refer to Appendix I for detailed meeting minutes.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	25-05-2023	Email TO relevant person	SLR replied to BWS' email received earlier that day advising they have forwarded their email to TGS as they don't have the information they requested and confirmed their assumption regarding aerial survey around and ahead of the vessel is correct.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	25-05-2023	Email TO relevant person	TGS replied to BWS' email received earlier that day and advised the majority of the lines are parallel to the coast. TGS continued they are still finalising the first season's polygon and therefore not in a position to share the information so have provided an indicative 3D line.	Y - Indicative survey lines	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	25-05-2023	Email TO relevant person	TGS replied to BWS's email requesting information about the survey vessel's average speed, confirming it is approximately 4-5 knots.	N	N/A	* (see note above table)	Continuing consultation.
Blue Whale Study Inc	25-05-2023	Email FROM relevant person	BWS emailed SLR requesting the shapefiles the seismic lines TGS plan to follow to help with their survey design. BWS asked TGS if they would prefer BWS conduct aerial surveys around the area where the seismic vessel is operating and immediately ahead of it.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Blue Whale Study Inc	25-05-2023	Email FROM relevant person	BWS replied to TGS' reply sent earlier that day regarding suvey lines and asked if TGS could provide an indication of the survey vessel's average speed.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Boating Industry Association of SA	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Boating Industry Association of SA	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Boating Industry Association of SA	16-02-2023	Email FROM relevant person	BIA responded to previous email from TGS to advise the BIA has no competence in this area and noted vessel operations are to be at least 40 km offshore and therefore out of range of interest to the vast majority of their members' customers.	N	N/A - out of range of interest	N/A	Consultation closed
Boating Industry Association of SA	20-02-2023	Email TO relevant person	Acknowledged BIA's response email 16/02/2023.	N	N/A	N/A	Consultation closed

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Bodalla Local Aboriginal Land Council	17-04-2023	Online enquiry form submitted	TGS submitted an online query form regarding their proposed marine seismic survey within the Otway Basin.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bodalla Local Aboriginal Land Council	20-04-2023	Phone call TO relevant person	TGS called BLALC to follow up from the online form submitted on 17/04/2023 and was diverted to an answer machine where TGS left a message to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bodalla Local Aboriginal Land Council	1-05-2023	Letter to relevant person	TGS posted a registered letter to BLALC advising of TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS enclosed an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 12/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bodalla Local Aboriginal Land Council	9-05-2023	Email TO relevant person	TGS emailed BLALC seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from BLALC to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked BLALC to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bodalla Local Aboriginal Land Council	22-05-2023	Phone call TO relevant person	TGS called BLALC to follow up on email sent 09/05/2023 regarding their proposed marine seismic survey however there was no answer. TGS left a message advising the purpose of their call and asked BLALC to call back, leaving contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bodalla Local Aboriginal Land Council	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Bodalla Local Aboriginal Land Council	31-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 06/06/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email. TGS also attached guidance from NOPSEMA to help with providing feedback about the survey and asked BLALC to let them know if they have any queries about their consultation program so they can make sure they can effectively participate in the process. TGS closed the email by stating if they had any questions or would like more information to call or email to discuss further.	Y- Information sheet and NOPSEMA guidelines for providing feedback	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	27-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	14-03-2023	Email TO relevant person	SLB emailed BLCAC to introduce themselves and advise they are partnering with TGS to conduct a marine seismic survey in the Otway Basin to commence later in the year. SLB advised they had sent a fact sheet to the general admin email and they called earlier today to follow up on that email and were provided two additional points of contact within the Bunurong Council. SLB advised they attached the factsheet, however are working on a shorter version which they are planning to send in the next few days. SLB said they hoped this would prompt further discussions with them regarding any concerns they may have regarding the proposed survey. SLB asked the BLCAC representatives to let them know if they had time to discuss (phone or online meeting) and said they were looking forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	14-03-2023	Phone call TO relevant person	SLB called the main office for BLCAC whom advised to forward information to two BLCAC representatives (names and contact details provided) for their review and potential further discussion. SLB confirmed they would send the factsheet and offer to call back in future.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	20-03-2023	Email TO relevant person	SLB emailed BLCAC to provide a simplified and shorter version of the proposed survey factsheet, which provides an explanation of why SLB/TGS is wanting to consult with them in regards to the planned project. SLB also state the factsheet highlights the aspects of what a MSS is and the potential affects on the environment, the measures SLB/TGS has in place to limit the potential effects and also what safeguards will be in place should an unexpected event occur. SLB said they would like to get some time online with BLCAC and whoever else from the Land Council BLCAC think might be interested to hear about the plans and more importantly they would like to hear if BLCAC has any concerns SLB closed the email by stating they could arrange an online meeting at their convenience to discuss further, thanked BLCAC and said they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	24-03-2023	Phone call TO relevant person	SLB called BLCAC following up on emails SLB had sent the previous two weeks that had not been responded to but did not get an answer. SLB left a voice mail message advising they had difficulty getting a response to previous emails.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	27-03-2023	Phone call TO relevant person	SLB called BLCAC following up on emails SLB had sent the previous weeks that had not been responded to but did not get an answer. SLB outlined the purpose of the call and BLCAC apologised for not responding to previous emails due to workload. BLCAC mentioned the EMBA and noted how the spill modelling indicated potential impact to the shoreline. SLB discussed the high level nature of the modelling and low likelihood of an event occurring. SLB advised it would be good if their environmental consultants (SLR) could help explain the modelling in a future meeting. BLCAC advised SLB they would review and discuss the factsheet internally this week and follow up with SLB regarding arranging an online call to discuss further. SLB thanked BLCAC for their time and advised they look forward to further discussions.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	31-03-2023	Email TO relevant person	SLB emailed BLCAC to follow up on call from start of the week and asked if they had time to review the factsheet (attached). SLB advised they would be happy to arrange an online meeting with them and others from BLCAC to present and discuss the project in more detail so SLB may better understand any concerns or sensitivities they may have.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	5-04-2023	Phone call TO relevant person	SLB called BLCAC to follow up on previous correspondence and spoke to the receptionist whom confirmed SLB had the correct BLCAC representatives to provide feedback but they were not available today. The receptionist suggested SLB resend the factsheet via email so they are at the top of their inbox and they would speak to the representatives tomorrow and took SLB's contact details to get them to call them.	Y - Updated information sheet	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	5-04-2023	Email TO relevant person	SLB emailed BLCAC following a phone call earlier to follow up on previous correspondence as advised by the BLCAC receptionist. SLB attached the information sheet again and advised BLCAC that the receptionist would touch base with them tomorrow to let them know that SLB had called. SLB said it would be great to get some feedback from BLCAC regarding the planned seismic survey as mentioned previously. SLB closed the email stating they are always available to meet online at BLCAC's convenience to discuss further if that was preferred and thanked BLCAC.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	14-04-2023	Phone call TO relevant person	SLB called BLCAC to follow up on previous correspondence and spoke to the receptionist whom transferred SLB to one of the BLCAC representatives that SLB had been emailing. BLCAC apologised for not getting back to SLB with feedback but indicated on review of the factsheet it would be better for consultation to be with the representative from the Land Use division and would email a connection to SLB on Monday 17/04/2023 when back in the office. SLB thanked BLCAC for his continued support in helping consultation move along.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	21-04-2023	Phone call TO relevant person	SLB called BLCAC to follow up on previous contact with BLCAC. SLB asked if BLCAC had connected them to a representative within their Land Use division. BLCAC confirmed they had and forwarded them the factsheet and they would get back to SLB next week, noting how busy BLCAC is with their current workload. SLB thanked BLCAC for their support.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	21-04-2023	Email TO relevant person	SLB replied to BLCAC's email received earlier that day thanking them for getting back to them. SLB advised BLCAC, they are partners with TGS who are leading the proposed seismic survey in the Otway and as part of the consultation process had been engaging with BLCAC to progress discussion primarily to explain the survey, listen to any concerns BLCAC may have and adapt their plan accordingly. SLB said it would be great to arrange an online meeting with BLCAC and others in the Land Council they believe would have an interest. SLB closed the email advising they would call BLCAC on Monday to discuss a plan. SLB included the updated information sheet within the email.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	21-04-2023	Email FROM relevant person	BLCAC emailed SLB regarding email sent to BLCAC on 05/04/2023 advising SLB to call regarding their email (contact details provided), alternatively happy to have a quick Teams meeting. BLCAC closed the email advising they would be happy to discuss with SLB.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	24-04-2023	Phone call TO relevant person	SLB called BLCAC to follow up on previous attempts to discuss proposed marine seismic survey within the Otway Basin but there was no answer. SLB left a message advising they would call back on Wednesday.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	27-04-2023	Phone call TO relevant person	SLB called BLCAC to follow up on previous correspondence to discuss proposed marine seismic survey within the Otway Basin but the appropriate contact was not available. SLB left a message for the BLCAC to call them back when they were available.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	3-05-2023	Email TO relevant person	SLB emailed BLCAC thanking them for getting back to them and advised they would send a meeting invite for 29/05/2023 at 11:00 hrs (AEST). SLB advised the meeting will have TGS and SLR on the call and take approximately 40 - 60 mins to present an overview of the project and work they have been doing with regards to the defined environment and sensitivities.	N	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	3-05-2023	Email TO relevant person	SLB emailed an online meeting invite to BLCAC for 29/05/2023 at 11:00 hrs (AEST), thanking them for the meeting slot.	N	N/A	* (see note above table)	Continuing consultation.
Bunurong Land Council Aboriginal Corporation	3-05-2023	Email FROM relevant person	BLCAC replied to SLB's previous emails and phonecalls apologising if SLB has been trying to call regarding the proposed marine seismic survey stating it would be better to discuss at an online meeting. BLCAC advised their next availability is 29/05/2023 and asked SLB to send a meeting invite through to confirm a date and time. BLCAC closed the email asking SLB to understand they are under pressure with many requests to review and discuss and aske to be patient when waiting for a response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Bunurong Land Council Aboriginal Corporation	29-05-2023	Meeting with relevant person	SLB, TGS, SLR met with BLCAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with BLCAC: - clarification of the EMBA; - clarificationon the purpose and main reason and outcome of the survey; and - consideration of intangible, historical cultural information that may not wished to be shared with proponents. BLCAC acknowledged TGS' efforts to consult with TOs and hoped they concentrated their effort with TO groups closer to activity. TGS concluded meeting advising they they would provide BLCAC with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Bunurong Land Council Aboriginal Corporation	1-06-2023	Email TO relevant person	TGS emailed the minutes from meeting held 29/05/2023.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
Burnie Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Burnie Council	16-02-2023	Email FROM relevant person	Automated reply acknowledging email and advising will be directed to appropriate department.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burnie Council	17-04-2023	Email TO relevant person	TGS emailed BC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked BC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A - out of survey or EMBA range	N/A	Consultation closed
Burrandies Aboriginal Corporation	29-03-2023	Email TO relevant person	TGS emailed BAC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided by 05/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Burrandies Aboriginal Corporation	4-04-2023	Phone call TO relevant person	TGS called BAC to follow up on their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to advise they were calling about the proposed marine seismic survey in the Otway Basin and they had sent an email on 29/03/2023 and to call them back (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burrandies Aboriginal Corporation	4-04-2023	Phone call TO relevant person	TGS returned BAC's message left earlier in the day regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burrandies Aboriginal Corporation	4-04-2023	Phone call FROM relevant person	BAC returned TGS's phone message left earlier in the day regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. BAC left a message advising they were returning TGS's call and left contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burrandies Aboriginal Corporation	11-04-2023	Phone call TO relevant person	TGS called BAC to follow up missed calls from the 04/04/2023. BAC advised they are best to contact their lawyer that represents them (email address provided) at South Australian Native Title Services.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burrandies Aboriginal Corporation	22-05-2023	Email TO relevant person	TGS emailed BAC to follow up on emails and phone calls from 27/04/2023 regarding their proposed marine seismic survey. TGS said that if BAC has any input about the proposed survey to advise them before 26/05/2023 so the information can be considered within the development of the environment plan before submitting to NOPSEMA soon. TGS closed their email advising BAC to contact them if they have any questions or would like any futher detail or reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Burrandies Aboriginal Corporation	22-05-2023	Email FROM relevant person	BAC replied to TGS' email sent earlier that day advising the email was provided and instructions were sought and they will continue to seek instructions.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Burrandies Aboriginal Corporation	22-05-2023	Email TO relevant person	TGS replied to BAC's email received earlier that day, thanking them.	N	N/A	* (see note above table)	Continuing consultation.
Burrandies Aboriginal Corporation	29-05-2023	Email TO relevant person	TGS emailted BAC to follow up on their email received 29/05/2023 and whether they had any feedback from BAC.	N	N/A	* (see note above table)	Continuing consultation.
Cape Barren Island Aboriginal Association Inc	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS asked CBIAA to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Cape Barren Island Aboriginal Association Inc	11-05-2023	Phone call TO relevant person	TGS called CBIAAI to follow up email sent 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising they were following up on their email sent 04/05/2023 and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cape Barren Island Aboriginal Association Inc	15-05-2023	Phone call TO relevant person	TGS called CIBAAI to follow up on previous correspondence. CIBAAI confirmed they had received the information. Both parties agreed TGS would call back in a week once CIBAAI had reviewed the information.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cape Barren Island Aboriginal Association Inc	15-05-2023	Email TO relevant person	TGS forwarded email TGS sent to CBIAA on 04/05/2023 following request during phone call earlier that day. TGS advised they would call in a week's time once they had a chance to review the information.	N	N/A	* (see note above table)	Continuing consultation.
Cape Barren Island Aboriginal Association Inc	22-05-2023	Phone call TO relevant person	TGS called CBIAA to follow up on phone call and email to CBIAA made 15/05/2023 regarding their proposed marine seismic survey within the Otway Basin but there was no answer. TGS left a message to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cape Barren Island Aboriginal Association Inc	24-05-2023	Phone call TO relevant person	TGS called CBIAA to follow up on phone call and message left 22/05/2023 regarding their proposed marine seismic survey within the Otway Basin but there was no answer. TGS left a message to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cape Barren Island Aboriginal Association Inc	26-05-2023	Phone call TO relevant person	TGS called CBIAA to follow up on phone call and message left 24/05/2023 regarding their proposed marine seismic survey within the Otway Basin but there was no answer. TGS left a message to return their call and advised they'd send an email also.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cape Barren Island Aboriginal Association Inc	26-05-2023	Email TO relevant person	TGS emailed CBIAA following their unanswered phone call earlier that day. TGS advised they had been unable to reach CBIAA so were following up with an email. TGS advised CBIAA the were finalising their environment plan (EP) before submitting to NOPSEMA for their completion check and once NOPSEMA advise the EP is complete it will be released for public consultation and hope to incorporate any feedback CBIAA may have from a meeting prior to their submission. TGS continued that if they are not available for a meeting and they have information they would like TGS to consider to let them know before 02/06/2023, alternatively they can provide feedback during the public consultation period.	N	N/A	* (see note above table)	Continuing consultation.
Cape Barren Island Aboriginal Association Inc	6-06-2023	Email TO relevant person	TGS emailed CBAAI advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked CBAAI to advise if they have any queries about their consultation program so they can make sure CBAAI can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where CBAAI has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking CBAAI to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Central Coast Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Central Coast Council	16-02-2023	Email FROM relevant person	Automated reply from CCC thanking TGS for their email and advising query will be referred to relevant department for appropriate action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Central Coast Council	17-04-2023	Email TO relevant person	TGS emailed CCC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked CCC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Central Coast Council	17-04-2023	Email FROM relevant person	Automated reply from CCC thanking TGS for their email and advising query will be referred to relevant department for appropriate action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Central Coast Council	5-05-2023	Email FROM relevant person	CCC replied to TGS' email sent 17/04/2023 advising that at this stage, they have no further queries regarding the proposed marine seismic survey within the Otway Basin.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Central Coast Council	8-05-2023	Email TO relevant person	TGS replied to CCC's email received 05/05/2023 noting their comments that CCC has no further queries regarding the proposed survey and asked if CCC would still like to remain on the consultation list.	N	N/A	* (see note above table)	Continuing consultation.
Central Coast Council	8-05-2023	Email TO relevant person	TGS replied to CCC's email received earlier that day advising TGS would update their records and offered to please get in contact if they have any queries.	N	N/A	* (see note above table)	Continuing consultation.
Central Coast Council	8-05-2023	Email FROM relevant person	CCC replied to TGS' email sent earlier that day advising they'd like to be removed from the mailing list.	N	N/A - requested to be removed from consultation list.	N/A	Consultation closed
Centre for Whale Research	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Centre for Whale Research	16-05-2023	Email FROM relevant person	Automated email advising the email could not be delivered.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Centre for Whale Research	22-05-2023	Online enquiry form submitted	TGS submitted an online enquiry regarding their proposed marine seismic survey within the Otway Basin advising they are seeking to engage with CWR as a potentially relevant person. TGS advised they would like to know whether they have any interests or activities that may be affected by the proposed survey. TGS requested CWR contact them if they have any questions or would like to meeting in person to go through the survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
CGG	24-03-2023	Email TO relevant person	TGS emailed CGG following a group meeting to discuss cumulative impacts within the Otway Basin. TGS said they think it would be worthwhile to meet up to discuss the TGS and CGG marine seismic surveys, in particular whether they can agree to surveys happening sequentially rather than at the same time and asked them to provide a time next week which is convenient.	N	N/A	* (see note above table)	Continuing consultation.
CGG	30-03-2023	Email TO relevant person	TGS emailed CGG to ask if they are available to meeting regarding the proposed Otway surveys.	N	N/A	* (see note above table)	Continuing consultation.
CGG	30-03-2023	Email TO relevant person	TGS responded to CGG's email sent earlier in the day suggesting to meet next week following the cumulative impacts meeting.	N	N/A	* (see note above table)	Continuing consultation.
CGG	30-03-2023	Email FROM relevant person	CGG replied to TGS' email sent earlier in the day, requesting to meet to discuss the proposed Otway surveys. CGG advised they think it would be good to meet next week if TGS is available and they are happy to plan a meeting earlier in the day to meet NZ time, though can't do Monday or Friday.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
CGG	30-03-2023	Email FROM relevant person	CGG replied to TGS' email sent earlier in the day, agreeing to meeting time following the cumulative impacts meeting next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
CGG	6-04-2023	Meeting with relevant person	TGS, SLB and SLR met with CGG to discuss ideas, plans and issues with their proposed marine seismic surveys within the Otway Basin. Topics discussed included consultation, survey timing and duration, proposed marine mammal control measures and information sharing.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
CGG	11-04-2023	Email TO relevant person	TGS emailed minutes from meeting held on 06/04/2023 with them, TGS, SLB and SLR.	N	N/A	* (see note above table)	Continuing consultation.
CGG	11-04-2023	Email FROM relevant person	TGS received out of office replies from CGG members that attended the meeting on 06/04/2023 advising on leave until 13 and 17 April.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	14-03-2023	Phone call TO relevant person	SLB called the main office for CHAC whom advised them to resent the factsheet which will then be forwarded to the Corporation members. CHAC asked for SLB's phone number so she could respond with any feedback in due course. SLB confirmed they would resend the factsheet and offer to call back again in the near future.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	14-03-2023	Email TO relevant person	SLB emailed CHAC following a phone call earlier that day. SLB introduced themselves and advise they are partnering with TGS to conduct a marine seismic survey in the Otway Basin to commence later in the year. SLB advised they had sent a fact sheet to the general admin email and they called earlier to follow up on that email. SLB attached the factsheet to this email, as requested by CHAC and advised they were working on a shorter version to be distributed in the coming days. SLB said they hoped this factsheet would prompt further discussions with CHAC regarding any concerns they may have with the proposed survey. SLB asked CHAC to provide this information onwards and let them know if representatives had time to discuss (phone call or online meeting). SLB closed the email stating they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	16-03-2023	Email TO relevant person	SLB replied to CHAC's email sent to SLB earlier in the day requesting a meeting. SLB advised TGS are leading the project data acquisition and with environmental consultants SLR, would be more than happy to get together to discuss over a presentation. SLB asked if they had a preferred day and time where CHAC would be available and advised SLB were flexible and would send an invite once arranged. SLB closed the email to thank them for responding.	N	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	16-03-2023	Email FROM relevant person	CHAC emailed SLB to request a meeting be arranged so they could better understand the potential impacts of the survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	20-03-2023	Phone call TO relevant person	SLB called CHAC to follow up on phone call from 14/03/2023 and asked CHACH availability for an online meeting to discuss the proposed project and listen to any of their concerns. CHAC confirmed Thursday 23/03/2023 would best suit them for a meeting. SLB confirmed meeting timing and sent a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	20-03-2023	Email TO relevant person	SLB emailed a meeting invite to CHAC for 23/03/2023 between 15:00 and 16:00 hrs to brief CHAC of their offshore Otway project to listen to their questions and concerns. SLB advised CHAC to forward internally to their members as they see fit.	N	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	23-03-2023	Meeting with relevant person	TGS, SLB and SLR met with CHAC to provide a presentation detailing the proposed survey, listen to feedback and discuss any questions that had. CHAC's key queries included: - whether the survey posed any elevated risk of dolphin strandings; - survey duration; - impacts to their cultural and commercial kelp harvesting; and - what happens if the data shows there is a resource in the area. CHAC advised the main concern for CHAC is about the environment and caring for the country. They also advised they would take the meeting information back to their members and distribute the factsheet to them also. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	29-03-2023	Email TO relevant person	TGS emailed CHAC meeting minutes from their meeting on 23/03/2023 for their review and to advise whether there was any sensitive information they do not wish to make available to public. TGS advised they would provide the fuel oil spill and underwater acoustic modelling reports once they have been finalised. TGS closed the email by thanking CHAC once again and offering to get in contact if they have any queries.	Y - Minutes from meeting held 23/03/2023.	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	14-04-2023	Email TO relevant person	TGS emailed copies of the underwater acoustic and fuel oil spill modelling reports as promised in the meeting held with CHAC on 23/03/2023.	Y - underwater acoustic and oil spill modelling reports	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	14-04-2023	Email FROM relevant person	Automated email advising the email was not delivered - due to large attachment size.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Aboriginal Corporation (Tas)	19-04-2023	Email TO relevant person	TGS emailed copies of the underwater acoustic and fuel oil spill modelling reports as promised in the meeting held with CHAC on 23/03/2023 as two separate emails to resolve the excessive attachment size.	Y - underwater acoustic and oil spill modelling reports	N/A	* (see note above table)	Continuing consultation.
Circular Head Aboriginal Corporation (Tas)	19-04-2023	Email FROM relevant person	Automated email advising one of the CHAC representatives that received the email was out of the office until 20/04/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Circular Head Council	16-02-2023	Email FROM relevant person	Automated reply from CHAC acknowledging email had been received and if after 10 working days TGS has not received a reply to contact CHC by phone.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	27-04-2023	Email TO relevant person	TGS emailed CHC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information other than an attached automated response. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked CHC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet and copy of automated email response	N/A	* (see note above table)	Continuing consultation.
Circular Head Council	4-05-2023	Phone call TO relevant person	SLB called CHC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative asked for a name and number for call back. SLB provided their contact details for CHC to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	8-05-2023	Email TO relevant person	TGS emailed CHC to follow up on phone call with SLB 04/05/2023 and provide CH information about their proposed marine seismic survey within the Otway Basin (attaching the information sheet). TGS advised CHC they will call over the next few days to make sure they've received the information and if they had any queries.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Circular Head Council	10-05-2023	Phone call TO relevant person	TGS called CHC to follow up on email TGS sent 08/05/2023 regarding their marine seismic survey proposed for the Otway Basin. TGS spoke to reception who advised everyone was currently out of the office however they would return TGS' call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	17-05-2023	Phone call TO relevant person	SLB called CHC to follow up on previous phone call made 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin. CHC asked if SLB could please resent the inforamtion sheet and call back later. SLB confirmed they would send an email following their call and call back later that day.	N	N/A	* (see note above table)	Continuing consultation.
Circular Head Council	17-05-2023	Email TO relevant person	SLB emailed CHC following their phone call earlier that day regarding their proposed marine seismic survey within the Otway Basin. SLB commented CHC would discuss with the relevant person and call SLB back (contact details provided). SLB closed the email advising they would be grateful if CHC could do this as soon as they receive this for SLB to receive feedback.	Y - Information sheet	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	17-05-2023	Phone call FROM relevant person	CHC returned SLB's call and message left earlier that day to discuss their prosposed marine seismic survey. CHC asked why they were being consulted and SLB explained the environment that may be affected (EMBA) triggered their engagement. CHC responded that likely no concerns but would send to final management for approval and then would send a formal response to SLB.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Circular Head Council	24-05-2023	Email FROM relevant person	CHC emailed TGS following a phone call with SLB earlier that day regarding their proposed marine seismic survey within the Otway Basin. CHC thanked TGS for providing them the opportunity to comment on the project, advising that council is not the responsible authority for foreshore and coastal areas. CHC continued they does manage several beachside parks, reserves, boat ramps, camping grounds and jetties within the municipality. CHC commented they do not have any particular concern with the detail provided in the information, however has a broad concern for the Circular Head ecology. CHC said they would support all [project] mitigation measures to ensure there is no detrimental effect to flora, fauna, fisheries, industrial seafood operations, coastal and river environments.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Circular Head Council	24-05-2023	Phone call FROM relevant person	CHC returned SLB's call made earlier that day regarding their proposed marine seismic survey within the Otway Basin. CHC advised they had reviewed the information SLB had emailed to them regarding the survey and did not require any further information relatied to the activity. CHC said they would confirm this in an email to SLB today.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Circular Head Council	24-05-2023	Phone call TO relevant person	SLB called CHC to follow up on previous phone calls and emails regarding the Otway Basin marine seismic survey however there was no answer. SLB left a message for CHC to return their call, providing contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Circular Head Council	25-05-2023	Email TO relevant person	TGS replied to CHC's email received 24/05/2023 thanking them for their formal reply advising they have noted CHC's comments and incorporated their concerns about the ecology of Circular Head and wider marine environment within the environmental plan. TGS also advied they will ensure CHC remains within their consultation program and is kept notified as the activity progresses. TGS closed the email advising CHC to contact them if they have any queries.	N	N/A	* (see note above table)	Continuing consultation.
Coastcare Victoria	27-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Coastcare Victoria	17-04-2023	Email TO relevant person	TGS emailed CV to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked CV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	16-02-2023	Email FROM relevant person	Automated reply email thanking TGS for their email and advising the email would be allocated to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	17-04-2023	Email TO relevant person	TGS emailed COSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked COSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	17-04-2023	Email FROM relevant person	Automated reply email thanking TGS for their email and advising the email would be allocated to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	4-05-2023	Phone call TO relevant person	SLB called COSC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative could not find a record of the email and asked for the email to be resent with a contact name to contact TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	8-05-2023	Email TO relevant person	TGS emailed COSC to provide a copy of the existing emails sent to COSC on 17/04/2023 and 16/02/2023 with the latest information sheet attached. TGS advised they would call over the next few days to check they had received and whether they had any queries or further information.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	8-05-2023	Email FROM relevant person	Automated email COSC acknowledging email sent by TGS earlier that day advising the email will be allocated to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	10-05-2023	Phone call TO relevant person	SLB called COSC to follow up on their previous call made on 04/05/2023 and email sent 08/05/2023 regarding their marine seismic survey proposed for the Otway Basin. The COSC representative was unsure about the status of the review of the information and suggested it was best to speak to their Apollo Bay office. COSC transferred the call to the Apollo Bay office but there was no answer. SLB left a message and asked them to return their call, leaving their contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	12-05-2023	Phone call TO relevant person	SLB called COSC to follow up on previous phone call made 10/05/2023 and email sent 08/05/2023. COSC confirmed the information had been received and advised the best person to speak to within the Environment and Sustainability team and transferred SLB to that contact but there was no answer. SLB left a message advising the reason for the call and asked them to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	15-05-2023	Email FROM relevant person	COSC emailed TGS to provide options for an online meeting date and time and advised who from council would be attending.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	16-05-2023	Email TO relevant person	TGS replied to COSC's email sent the day before confirming a meeting date for 29/02/2023 at 14:00 hrs and advised they will send an online meeting to COSC following this email. TGS explained they will provide an overview of the survey, the EP development and discuss any queries Council has and asked COSC to send through any specific aspects they like TGS to address and to let TGS know if they needed any further information.	N	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	16-05-2023	Email TO relevant person	TGS emailed an online meeting invite to COSC including the latest information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	16-05-2023	Email FROM relevant person	COSC replied to TGS' email sent earlier that day confirming a meeting date and time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Colac Otway Shire Council	29-05-2023	Meeting with relevant person	TGS, SLB and SLR met with COSC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with COSC: - Increase consultation for activities within the general area; - Council formal position opposing any seismic testing in the Otway Basin in relation to environmental and fishing issues; - Marine protected areas; - Marine mammal control measures, e.g. whale migration routes; - Support vessels visiting local harbours; - Activity visibility from shore; - Clarification of 'multi-client'; and - Commercial fishing compensation. COSC suggested other parties TGS could consult as relevant persons of which all are being consulted. COSC concluded meeting advising they thought TGS provided a good presentation and askd if they could distribute to other Council staff and parties and TGS confirmed this would be ok. TGS advised they would provide COSC with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific itesm raised in the meeting are discussed in detail in the EP as follows: Consultation: **Section 5** (consultation), all consultation with COSC will be ongoing to ensure COSC receives sufficient information and is provided with sufficient time to respond Marine protected areas: **Section 4.4** (existing environment), with potential imapcts of planned and unplanned activities discussed in detail across **Sections 7.1.2.4** (physical presence) , **Section 7.2.2.5.1** (acoustic disturbance), **Section 8.1.2** (IMS), **Section 8.3.3.4.2** (hydrocarbon spill), **Section 8.5.2** (hazardous and non-hazardous waste) Marine mammal control measures: **Table 84** Commercial fishing compensation: **Table 84** and agreed protocols. Ongoing consultation with COSC will be undertaken in accordance with the methods set out in Section 5 to ensure COSC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects, in particular for items raised during the consultation meeting concerning commercial fishers and environmental protection measures.	Continuing consultation.
Colac Otway Shire Council	1-06-2023	Email TO relevant person	TGS emailed the minutes from meeting held 29/05/2023.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	5-06-2023	Email FROM relevant person	COSC replied to TGS' email sent 01/06/2023 advising they have forwarded the email and minutes to the relevant people as requested.	N	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	5-06-2023	Email FROM relevant person	COSC replied to TGS' email sent 05/06/2023 asking TGS to keep COSC on the consultation list to keep them updated with TGS' activities.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Colac Otway Shire Council	6-06-2023	Email TO relevant person	TGS replied to COSC's email received 05/06/2023 thanking them for forwarding the information on to the relevant persons.	N	N/A	* (see note above table)	Continuing consultation.
Colac Otway Shire Council	6-06-2023	Email TO relevant person	TGS replied to COSC's email received 05/06/2023 thanking them for their reply and confirming they will keep COSC on their consultation list and offered if anything arises in the meantime to get in touch with TGS.	N	N/A	* (see note above table)	Continuing consultation.
Commission for the Conservation of Southern Bluefin Tuna	8-06-2023	Email TO relevant person	TGS emailed CCSBT seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from CCSBT to ensure they know about their functions, interests or activities that may be impacted by the survey. TGS also provided information to help CCSBT provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked CCSBT to advise if they would like to discuss further or would like more information (providing contact details) or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Commission for the Conservation of Southern Bluefin Tuna	15-06-2023	Email TO relevant person	TGS emailed CCBST advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but it was not too late to provide a response and attached the information sheet. TGS also attached guidance from NOPSEMA to help with providing feedback about the survey and asked CCSBT to let them know if they have any queries about their consultation program so they can make sure they can effectively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where CCSBT has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS advised they'd welcome an online meeting if CCSBT would like TGS to provide an overview of their project and discuss any concerns CCSBT has. TGS closed the email asking CCSBT to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Commission for the Conservation of Southern Bluefin Tuna	15-06-2023	Email FROM relevant person	CCBST replied to TGS' email sent earlier that day advising CCSBT will not be providing feedback on this survey.	N	N/A	* (see note above table)	Continuing consultation.
Commission for the Conservation of Southern Bluefin Tuna	16-06-2023	Email TO relevant person	TGS replied to CCSBT's email received the day before thanking them for their response and asked CCSBT if the want to be removed from TGS' consultation or would they still like to receive updates.	N	N/A	* (see note above table)	Continuing consultation.
Commissioner for Environmental Sustainability of Victoria (Department of Energy, Environment and Climate Action)	25-05-2023	Email TO relevant person	TGS emailed CES seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from CES to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked CES to reply before 02/06/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Commissioner for Environmental Sustainability of Victoria (Department of Energy, Environment and Climate Action)	25-05-2023	Email FROM relevant person	Automated reply to TGS' email sent earlier that day advising the email has been received.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	13-05-2022	Email TO relevant person	TGS state they are contacting CFA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of the Commonwealth fisheries	N/A	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	17-05-2022	Email FROM relevant person	The stakeholder responded to request a short informal meeting with the CFA executive officer in-between sessions of the APPEA conference on the 18th May 2022.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Commonwealth Fisheries Association (CFA)	17-05-2022	Email TO relevant person	TGS/Schlumberger responded to CFA to accept the meeting and gave details of the location of the TGS booth at the APPEA conference.	N	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	17-05-2022	Email FROM relevant person	The stakeholder advised that they will find the TGS booth at the conference.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	23-05-2022	Email FROM relevant person	CFA advised that they had spoken to key fisheries stakeholders and that the general consensus was to organise an initial fisheries stakeholder online meeting with TGS/Schlumberger to introduce the project and discuss general information.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Commonwealth Fisheries Association (CFA)	25-05-2022	Email TO relevant person	TGS/Schlumberger agreed to set-up an online meeting with stakeholders and requested CFA provide some potential days/times for the meeting. TGS/Schlumberger also acknowledged that multiple meetings may be required for all stakeholders to attend.	N	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	26-05-2022	Email FROM relevant person	CFA agreed to this time, noting that others will need to be contacted to determine their availability.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Commonwealth Fisheries Association (CFA)	26-05-2022	Email TO relevant person	TGS/Schlumberger suggested Thursday 2nd June 1 pm Melbourne time for the meeting.	N	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	26-05-2022	Email FROM relevant person	CFA provided days that would suit a meeting with stakeholders.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	27-05-2022	Email FROM relevant person	CFA noted that other stakeholders should be contacted by TGS/Schlumberger (not CFA) to determine their availability.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Commonwealth Fisheries Association (CFA)	27-05-2022	Email TO relevant person	TGS/Schlumberger indicated that they will send out a teams invite once the time is confirmed by other stakeholders.	N	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	02-06-2022	Meeting with relevant person	TGS/Schlumberger/ERM presented an overview of the survey, and of the commercial fishing effort for relevant Commonwealth and State managed fisheries based on available data. The stakeholder confirmed Giant Crab habitat extends deeper than the 140-300m core fishing depths and lies within the 3D Active Source Area for the survey. They stated the some fisheries, such as the Squid Jig fishery, are variable. Given the length of the EP period, TGS/Schlumberger will need to keep the fisheries informed. The stakeholder queried if TGS/Schlumberger are considering alternative technologies to traditional seismic sources. TGS/Schlumberger confirmed the survey will apply traditional seismic and that alternative technologies are considered as part of the ALARP process. However, due to their limited commercial availability or effectiveness in some cases, the EP seeks approval for using a traditional seismic source; if alternative technologies or sources are available at the time of a survey that may reduce the range to effects, then this is of benefit, but it is difficult to commit to these methods when they may not be commercially available within Australia when surveys need to take place. The stakeholder explained that investment in research into the effects of seismic on relevant target species would also be welcomed by the industry. They flagged that some of the seafood industry organisations aren't as mature as others and don't have resources. Attention is needed to determine key contacts for all relevant stakeholders. TGS / Schlumberger sought the groups' suggestions on best approach for ongoing engagement, whether it be with each organisation separately or if they wanted to nominate a main representative. Attendees suggested ongoing consultation with each industry association. Refer to Appendix I for detailed meeting minutes.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised. Information regarding giant crab and Southern Squid Jig Fishery incorporated into the EP. Recommendation for research is noted. TGS/SLB support the notion of further research, however, currently TGS/SLB ability to fund research will depend upon survey funding / future joint industry funding opportunities and no specific studies are currently planned. EP will be assessed based on current available research and data.	* (see note above table)	No action required. Continuing consultation.
Commonwealth Fisheries Association (CFA)	7-06-2022	Email FROM relevant person	Meeting request declined for stakeholder meeting on 9 June 2023 12:30-1:30 PM (UTC+08:00) Perth.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	10-06-2022	Email TO relevant person	Reply to clarify that additonal meetings being held are repeats for those who can't attend other times.	N	N/A	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	10-06-2022	Email TO relevant person	Email to notify 31 stakeholders that the scheduled online call has been logged off as no one is available to attend.	N	N/A	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	10-06-2022	Email FROM relevant person	Clarification on the additional meetings being held and if they are a repeat of the initial meeting held the previous week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholders for their attendance and participation in the meeting on June 2nd. TGS/Schlumberger highlighted that the attached 2019 report includes a summary of the proportion of historical catch in each fishery that was overlapped by that survey area, and that the current Otway Basin 3D MSS area is similar. TGS/Schlumberger also noted that the stakeholder from SETFIA pointed out there are areas where overlap is expected to be significantly reduced. TGS and Schlumberger informed the stakeholders that they have engaged SETFIA to compile similar information for the Otway Basin 3D MSS.	Y - Summary meeting notes - Copy of the 2019 Schlumberger Otway 2D Seismic Survey report prepared by SETFIA	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	28-06-2022	Email FROM relevant person	CFA declined an invitation to a stakeholder meeting scheduled for June 29th 9:00-10:00am AWST.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Commonwealth Fisheries Association (CFA)	15-02-2023	Email FROM relevant person	Reply email to advise the CFA is not resourced to provide EP feedback and to direct enquiries to the associations that directly represent each fishery. The email also advised the increasing volume of consultation requests is beyond the capacity of most associations and as a result expect to engage associations on a fee basis.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Ongoing consultation with CFA will be undertaken in accordance with the methods set out in **Section 5** to ensure CFA have had both sufficient information, and sufficient time to engage in the consultation programme.	Continuing consultation.
Commonwealth Fisheries Association (CFA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	15-02-2023	Email TO relevant person	Reply email to CFA to thank them for their reply and information and advised them TGS would be engaging directly with fisheries and fishers.	N	N/A	* (see note above table)	Continuing consultation.
Commonwealth Fisheries Association (CFA)	15-02-2023	Email FROM relevant person	Reply email from CFA thanking TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
ConocoPhillips	01-06-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	5-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	12-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	12-04-2023	Email FROM relevant person	Automated reply from CP advising the contact is on leave until 18/04/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
ConocoPhillips	18-04-2023	Email TO relevant person	TGS replied to CP's email received earlier that day advising the entity is to be TGS-NOPEC Geophysical Company Pty Ltd.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
ConocoPhillips	18-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
ConocoPhillips	26-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Letter of agreement to share data	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
ConocoPhillips	27-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Letter of agreement to share data	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	2-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Aerial cetacean sighting data	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
ConocoPhillips	2-05-2023	Email TO relevant person	TGS replied to CP's emailed received earlier that day seeking clarification on confidential information.	N	N/A	* (see note above table)	Continuing consultation.
ConocoPhillips	2-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
ConocoPhillips	4-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Updated aerial cetacean sighting data	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Conservation Council of SA	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Conservation Council of SA	16-02-2023	Email FROM relevant person	Automated email notifying TGS the email sent to CCSA on 16/02/2023 was underliverable. TGS resent to alternative email address and did not receive an 'undeliverable' notification.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Conservation Council of SA	17-04-2023	Email TO relevant person	TGS emailed CCSA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked CCSA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Conservation Council of SA	17-04-2023	Email FROM relevant person	Automated email notifying TGS the email sent to CCSA on 17/04/2023 was undeliverable. TGS resent to alternative email address and did not receive an 'undeliverable' notification.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Conservation Council of SA	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Conservation Council of SA	22-05-2023	Email FROM relevant person	CCSA replied to TGS' email sent 22/05/2023 regarding their proposed marine seismic survey within the Otway Basin. CCSA asked if they could receive a briefing on what is proposed and if so, they can double check their understanding, invite member groups who have an interest in thet information and provide an opportunity to ask questions.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Conservation Council of SA	23-05-2023	Email TO relevant person	TGS replied to CCSA's email received the day before confirming they can provide a briefing with details about their proposed marine seismic survey within the Otway Basin and answer any questions they may have. TGS asked if they would be available 25/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Conservation Council of SA	26-05-2023	Email TO relevant person	TGS emailed CCSA to follow up on an email TGS sent to CCSA trying to arrange a meeting with them and asked CCSA to confirm if they would still like to meet and suggest some dates and times that would be convenient for them.	N	N/A	* (see note above table)	Continuing consultation.
Cooper Energy	01-06-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Cooper Energy	20-10-2022	Email TO relevant person	Email informing of planned start date, aiming for initial phase in September 2023.	N	N/A	* (see note above table)	Continuing consultation
Cooper Energy	20-10-2022	Email TO relevant person	Email thanking CE for informing of their planned offshore construction works during 2024 and 2025 and updating CE on changes i.e. that the 3D acquisition will be in over 500m of water with a 2D tie line in T/P30 to a water depth of approximately 115 m.	Y - PPTX information sheet and XLS of coordinates	N/A	* (see note above table)	Continuing consultation
Cooper Energy	20-10-2022	Email FROM relevant person	CE thanking TGS for information sent and asking what time of the year will they be offshore	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cooper Energy	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Cooper Energy	16-02-2023	Email TO relevant person	TGS replied to CE's previous email providing coordinates as requested and advising the size of the area has been reduced by removing any active source area in SA waters. TGS offered to let them know if they need any other information.	Y - amended shapefiles (coordinates)	N/A	* (see note above table)	Continuing consultation.
Cooper Energy	16-02-2023	Email FROM relevant person	Reply to previous TGS email advising they will review and reply before deadline. CE asked if the coordinates sent last year are the same as the current information sheet.	Y - Updated information sheet and previous sent coordiates (Excel spreadsheet)	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Cooper Energy	23-02-2023	Email FROM relevant person	CE responded to TGS' previous email (16/02/2023) acknowledging TGS' update and coordinates.CE advised the EP area is approximately 13 km from the COE permits (provided an image within the email) and CE doesn't forsee any issues at this stage but would like to be kept informed, especially as the schedule is confirmed, as CE may have vessels in the region depending on when TGS mobilise.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Cooper Energy	23-02-2023	Email TO relevant person	TGS acknowledged CE's previous email (dated 23/02/2023) and confirmed they will keep CE informed and up to date as schedule progresses.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	17-04-2023	Email TO relevant person	TGS emailed CSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked CSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	5-05-2023	Phone call TO relevant person	SLB called CSC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative could not find a record of the email and asked for the email to be resent with a contact name to contact TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Corangamite Shire Council	8-05-2023	Email TO relevant person	TGS emailed COSC to provide a copy of the existing emails sent to COSC on 17/04/2023 and 16/02/2023 with the latest information sheet attached. TGS advised they would call over the next few days to check they had received and whether they had any queries or further information.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	10-05-2023	Phone call TO relevant person	TGS called CSC to follow upon the email sent 08/05/2023 regarding their proposed marine seismic survey within the Otway Basin. The CSC CEO asked TGS to send them the information and advised they would be in contact if they needed additional information. TGS suggested an online meeting after they'd read the information and CSC agreed that would be good.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Corangamite Shire Council	10-05-2023	Email TO relevant person	TGS emailed COSC following their phone call earlier that day. TGS emailed a copy of the information sheet about their proposed marine seismic survey. TGS asked COSC to advise when it would be convenient to have a meeting to go through the project details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	15-05-2023	Phone call TO relevant person	TGS called COSC to follow up on phone call and email TGS sent 10/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS spoke to reception who advised the person they need to speak to was in a meeting. TGS left a message for them to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Corangamite Shire Council	17-05-2023	Phone call TO relevant person	SLB called CSC following up on previous phone calls regarding their proposed marine seismic survey. CSC confirmed they had received the information sheet sent 05/05/2023 although the relevant person was not available to discuss. The CSC reception said they would follow up with the appropriate person and ask them to response or call SLB to discuss further.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	19-05-2023	Email TO relevant person	TGS emailed CSC advising they are visiting Victoria week commencing 29/05/2023 and would welcome the opportunity to meet with CSC and asked if they would be available for a meeting 30/05/2023 in Port Campbell.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	19-05-2023	Email FROM relevant person	CSC replied to TGS' email sent earlier that day advising they may potentially be available for a meeting 30/05/2023 and asked what time.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	19-05-2023	Email TO relevant person	TGS replied to CSC's email received earlier that day advising they can make it any time after 10 am and before 3 pm just let them know.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	19-05-2023	Email FROM relevant person	CSC replied to TGS' email sent earlier that day advising meeting for 10 am at [location provided].	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Corangamite Shire Council	30-05-2023	Meeting with relevant person	TGS, SLB and SLR met with CSC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with CSC: - What concerns traditional owners are raising. - The behaviour of noise underwater and noise modelling. - Marine mammals and control measures, e.g. MFOs and PAM. - Communication with other mariners. CSC said the main concerns for the local community include impacts to: - crayfishing; - tourism (Great Ocean Rd, whale watching); and - environment in general and from cultural view. TGS advised they would provide CSC with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific items raised in the meeting are discussed in detail in the EP as follows: Underwater noise: **Section 7.2.1** (noise modelling and description of imapcts), and **Section 7.2.2** (assesment of impacts and risks of underwater noise) Marine mammals and control measures: Table 84 Communication with other mariners: **Table 58** (communication to relevant persons including commercial fishers and AHO indicating publication of Notice to Mariners) Commercial fishers: **Section 7.1.3.1.1** (impacts of the physical presence of the seismic survey vessel and equipment), **Section 7.2.3.1** (acoustic imapacts) and **Section 8.3.4.1** (hydrocarbon spill) Recreation and tourism: **Section 7.1.3.3** (impacts of the physical presence of the seismic survey vessel and equipment), **Section 7.2.3.2** (acoustic imapcts on recreational dive operators), **Section 8.3.4.3** (hydrocarbon spill) Ongoing consultation with CSC will be undertaken in accordance with the methods set out in Section 5 to ensure CSC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects, in particular for items raised during the consultation meeting concerning commercial fishers and environmental protection measures.	Continuing consultation.
Corangamite Shire Council	16-06-2023	Email TO relevant person	TGS emailed CSC to provide them with a copy of the minutes from their meeting held 30/05/2023 and a copy of the presentation and asked CSC to advise them of any amendments of text that needs removing. TGS advised they have incorporated CSC's comments and queries within their environment plan (EP) and will submit to NOPSEMA for their completeness check. TGS continued that once NOPSEMA advise the EP is complete it will be released for public consultation where TGS can incorporate more feedback from the community, then TGS will submit the EP to NOPSEMA again for their overall complete assessment. TGS asked CSC to advise them whether they would like to remain on their consultation list to keep updated with their progress or would they prefer to be removed from the consultation program.	Y - Meeting minutes and copy of presentation	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	16-06-2023	Email FROM relevant person	CSC replied to TGS' email sent earlier that day thanking them for their email and asked to continue to keep them informed about their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Corangamite Shire Council	16-06-2023	Email TO relevant person	TGS replied to CSC's email received earlier that day advising they have updated their consultation register and noted to keep CSC within their consultation program to keep updated with TGS' progress.	N	N/A	* (see note above table)	Continuing consultation.
CSIRO	7-05-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is planning to undertake marine seismic survey in Otway Basin and seeking to engage with CSIRO as a potential relevant person in accordance with government consultation requirements. TGS advised that if CSIRO provide an appropriate contact, they will provide more information. TGS also advised they would like to knowwhether CSIRO has any interests or activities that may be affected by the survey so TGS can learn what these might be and discuss how any impacts may be avoided or mitigated. TGS also invited CSIRO to let them know if they would like to ask any questions or meet in person to go over the proposed survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
CSIRO	15-06-2023	Email FROM relevant person	CSIRO replied to the online equiry form submitted 07/06/2023 thanking TGS for contacting CSIRO. CSIRO advised they have contacted the EBU and don't believe TGS' query is relevant to them and have been informed they don't have anything to do with TGS' work and aren't among the stakeholders.	N	N/A	* (see note above table)	Continuing consultation.
CSIRO	15-06-2023	Email TO relevant persons	TGS replied to CSIRO's email received earlier that day thanking CSIRO for advising TGS' query is not relevant to them and they do not consider themselves a stakeholder. TGS advised they have noted this and will remove them from their consultation program. TGS closed their email advising CSIRO to get in contact with them if they have any queries regarding their project arise.	N	N/A	* (see note above table)	Continuing consultation.
Deakin University - School of Life and Environmental Sciences	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Deakin University - School of Life and Environmental Sciences	16-05-2022	Email FROM relevant person	Automated email acknowledging that Deakin University received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will give an initial response within 2 business days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Deakin University - School of Life and Environmental Sciences	16-05-2022	Email FROM relevant person	Automatic reply to acknowledge receipt of email and will be actioned within 2 days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Deakin University - School of Life and Environmental Sciences	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Deakin University - School of Life and Environmental Sciences	17-04-2023	Email TO relevant person	TGS emailed DU to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DU to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Deakin University - School of Life and Environmental Sciences	17-04-2023	Email FROM relevant person	Automated email acknowledging that Deakin University received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will give an initial response within 2 business days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Deakin University - School of Life and Environmental Sciences	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department for Energy and Mining (DEM)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Australian Antarctic Division - Australian Marine Mammal Centre	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Biosecurity (marine pests)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Biosecurity (vessels, aircraft and personnel)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Fisheries	13-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Underwater Cultural Heritage	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Underwater Cultural Heritage	19-05-2022	Email FROM relevant person	The email acknowledges that the DAWE received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will review the survey details. They indicated that they will respond before 01/07/2022.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Agriculture Water and the Environment (DAWE) - Underwater Cultural Heritage	29-06-2022	Email FROM relevant person	The stakeholder noted that since the proposed activities will not impact the seabed within the survey/project area, they do not consider it likely that protected or potentially significant UCH will be adversely impacted. This withstanding, the Department notes that TGS/Schlumberger will still have a legal obligation to notify the discovery of UCH if this occurs during the survey. A summary of notification requirements are detailed. DAWE consulted with partner agencies and the following was highlighted - Although the Otway Basin 3D MC MSS project will not disturb the seabed, is anticipated that the survey may lead to works that will impact the seabed. It is recommended that the data TGS and Schlumberger collect during the survey be made available to a qualified maritime archaeologist. The Department recommends TGS and Schlumberger engage a suitably qualified maritime archaeologist to ensure that the resolution level of the 3D MC MSS data capture will be sufficient for both current and future UCH management needs.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Agriculture, Fisheries and Forestry	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Department of Agriculture, Fisheries and Forestry	16-02-2023	Email FROM relevant person	Automated reply acknowledging email and advising they will respond as soon as possible or within 10 working days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Agriculture, Fisheries and Forestry	12-04-2023	Email TO relevant person	TGS emailed DAFF to follow up on email and information sent on 16/02/2023 about their proposed marine seismic survey within the Otway Basin. TGS advised they are consulting about the proposed survey, to ensure they can provide an informed response about whether the activity is likely to impact you're function, interests or activities. TGS attached the latest version of information sheet and offered for DAFF to let them know if they would like further information or have any queries.	Y - Updated information sheet and copy of previous email sent	N/A	* (see note above table)	Continuing consultation.
Department of Agriculture, Fisheries and Forestry (Seaports Program)	12-04-2023	Email FROM relevant person	DAFF replied to TGS' email sent earlier in the day advising they can support the vessel's visit into Australian territory. DAFF advised of the obligations under the Biosecurity Act 2015, including in summary: - pre-arrival process and reports; - Ship Sanitation Control Certificate or exemption; - Australian Ballast Water requirements; - biofouling management requirements; - MARS permission if entering Australia via a non-first point entry; - biosecurity requirements; and - Routine vessel Inspections. DAFF closed the email by providing a contact email address if any questions.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific claims raised by DAFF are detailed in **Section 8.1** (Introduction of invasive marine species), specific control measures are listed in **Table 107**.	Continuing consultation.
Department of Agriculture, Fisheries and Forestry (Seaports Program)	17-04-2023	Email TO relevant person	TGS replied to DAFF acknowledging their email received 12/04/2023, thanking them for taking the time to respond regarding their proposed marine seismic survey. TGS advised DAFF they have incorporated the information DAFF has provided within their survey planning and environmental plan, noting the key biosecurity obligations and requirements and pre-arrival and arrival processes. TGS closed their email by offering for DAFF to let them know if they need any further information or queries. TGS closed the email by thanking DAFF again.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	17-06-2022	Email TO relevant person	TGS/Schlumberger contacted the stakeholder to request a meeting to discuss any queries DNP may have in relation to the Nelson and Zeehan marine parks. Options for days to hold the meeting were provided.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	30-06-2022	Email FROM relevant person	The stakeholder apologised for their slow response and thanked TGS/Schlumberger for the follow-up. They explained that they are currently reviewing the information provided by TGS/Schlumberger and discussing the matter internally. They said they will be in touch the following week to discuss possible meeting times.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	07-07-2022	Email FROM relevant person	The stakeholder apologised for the delay in responding. The stakeholder explained that they would be available to meet during the week of the 25th July at a time that was convenient for TGS/Schlumberger.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	13-07-2022	Email TO relevant person	TGS thanked the stakeholder for their reply and proposed Monday the 25th July for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	18-07-2022	Email FROM relevant person	The stakeholder agreed to this date and proposed anytime between 1-3pm AWST. Once the time is set the stakeholder will send a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	25-07-2022		The stakeholder advised that they are preparing a formal response. This will be comprehensive and is expected to be similar to the response prepared for ConocoPhillips for the Sequoia 3D MSS. The response will cover knowledge gaps, particularly in relation to impact pathways. The stakeholder also advised that the response will consider users of the AMPs, including fisheries. The stakeholder queried as to whether they could be sent a draft of the EP to allow for a more focussed response. TGS/Schlumberger/ERM advised that many sections of the EP are still being drafted and were not in a state of completeness suitable to provide to Marine Parks.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	02-08-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for their participation in the meeting and attached the various documents that were requested including shapefiles for the various polygons.	Y - Summary of call - Copy of slides - Information sheet - Survey area co-ordinates - Shapefiles for polygons	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	10-08-2022	Email TO relevant person	TGS/Schlumberger contacted the stakeholder to confirm they have all the information they require to develop a response, and queried as to when the response would be available.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	16-08-2022	Email TO relevant person	TGS/Schlumberger followed up their previous email and asked when the stakeholder expects they would be providing a formal response.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	23-08-2022	Email FROM relevant person	The stakeholder noted that given the commitment that the environment plan will identify and mitigate impact to the Nelson and Zeehan marine parks, they have no further claims or objections. In the event of any oil/gas pollution incident - the stakeholder explained that they should be notified of any incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. They went on to explain that daily or weekly Situation Reports may be requested, depending on the scale and severity of the pollution incident.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	23-08-2022	Email FROM relevant person	The stakeholder corrected an error from the previous correspondence.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	23-08-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for their participation in the call, and confirmed that the survey will exclude seismic acquisition in waters shallower than 1,000 m adjacent to Tasmanian fishing areas, and this has been adopted as a control in the EP.	Y - Map of Giant Crab acoustic exclusion area	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from the Marine Parks website as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	14-03-2023	Email FROM relevant person	Automated reply acknowledging previous email (sent from TGS 14/03/2023).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	6-04-2023	Email FROM relevant person	The Director of National Parks (DNP) (representing the DCCEEW) emailed thanking TGS for the opportunity to comment on the Otway 3D seismic survey. In summary the key comments included: - overlaps Nelson and Zeehan marine parks (form part of the South-east Marine Parks Network) and if not managed could affect the parks' natural, social and economic values (information on marine park values was included). - intersects KEFs West Tasmanian Canyons and Bonney Coast Upwelling - high productivity and aggregations of marine life. - overlaps or adjacent to BIAs for numerous protected seabirds, Southern Right Whales, Pygmy Blue Whales, Southern Rock Lobster and Giant Crab. - overlaps or adjacent to recent seismic activities undertaken and is near another proposed seismic activity. The DNP makes the following objections and claims: - Activities that may prevent or displace Pygmy Blue Whales or Southern Right Whales' use of BIAs are avoided. - Activities are timed to avoid species' peak migration and foraging behaviours. - Potential cumulative impacts upon species are addressed, noting this activity overlaps a recent seismic survey and is near to another that is planned. This should include, but not limited to acoustic impacts to cetaceans (PTS and TTS) as well as impacts to availability of food (krill). Furthermore, impacts to Giant Crab and Southern Rock Lobster should be explored noting some populations could be exposed to repeated surveys. - Identify a comprehensive suite of whale detection measures including regular aerial surveillance flights to identify presence / absence / species and direction of movement and PAMs to support the efficacy and reliability of shut down protocols for marine mammals. - Seismic array to operate at low power during line turns to minimise the risk of SRW and BW entering the zone of potential TTS or behavioural disturbance during shut down. - Spatial avoidance of fishing grounds and, or, temporal avoidance of fishing seasons. - Excising Giant Crab and Southern Rock Lobster habitat within the canyon area in the southwest of the survey from the acquisition area, consistent with that applied to the ConocoPhillips Sequoia survey. - Reducing the overall area to be surveyed or splitting the area into smaller areas to be acquired to avoid peak utilisation rates and reduce cumulative impacts upon the environment. - Set a limit to the number of days for acquisition at full power and, or, the total distance of sail lines for acquisition at full power. Also explained, NOPSEMA has developed and published (in close work with Parks Australia) a guidance note outlining what titleholders need to consider and evaluate in their EPs. The DNP state that when preparing the EP, TGS should consider Australian marine parks and their representativeness and ensure the EP: - identifies and manages all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable. - clearly demonstrates that the activity will not be inconsistent with the management plan. The DNP also stated they should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible. Notification should be provided to the 24 hour Marine Compliance Duty Officer on 0419 293 465 and should include specific information (list provided). The DNP also stated they may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident. Refer to Appendix H for a copy of the full submission.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific claims raised by DNP are set out in the following sections of the EP: Pygmy and Blue whales: Effects are dsicussed in detail in **Sections 7.2.2.5.2** (BIA) and **7.2.2.3.6** (marine mammals), with Control Measures (cetacean specific) listed in **Table 84**. Whale detection methods: Refer to Control Measures in **Table 84.** Activities are timed to avoid species' peak migration and foraging behaviours: Behavioural; effects, inlcuding foraging, are discussed in detail in **Section 7.2.2.3** (including marine mammals, seabirds, and bony fish). Control Measures (cetacean specific and other sensitice receptor specific) listed in **Table 84**. Cummulative impacts: **Table 84** lists control measures to require a SIMOPS plan, which inlcudes the implementation of a 40 km spatial separation between Seismic Vessels. **Section 9** sets out the approach to manageing Cumulative Impacts. Outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP. Spatial avoidance of fishing grounds: **Table 84** lists control measures for communciation protocols with commercial fishers. **Table 84** lists the control measure for compensation to fishers for any claims received in accordance with the agreed compensation protocol. Seismic array control measures: Table 84 lists all relevant acoustic source control measures for ensuring adherence to the controls within the Aquisition Area, and ensure compliance outside the AA. Excising giant crab and rock lobster from Acquisition Area: Details of the Giant Crab Acoustic Exclusion Area are listed in Section 7.1.3.1.3.2 and Table 57. Reducing area or splitting , avoid peak utilisation rates and cumulative effects: Section 9 discussed Cumulative Effecst in detail. Effects on AMP: Effects to AMPs (and other sensitive areas) are discussed in detail in Section 7.2.2.5 (for planned activities), Section 8.1.2 (IMS), Section 8.2.2 (Streamer Loss), Section 8.3.3.4 (hydrocarbon spill), and Section 8.5.2 (accidental release of hazardous and non-hazardous materials). Control Measures for each respective impact are listed. Section 10 details the Implementation Plan which ensures effects are consistent with the EP (see Section 10.4) ,and there is a process to monitor and report to ensure this consistency, including all aspects of monitoring and reporting, (Section 10.4.1), Management of non-conformance (Section 10.4.4), EP Revision and Improvement (Section 10.4.5), Management of Change (Section 10.4.5) if required. DNP has been added to the notifications procedures ini the unlikely event of a hydrocarbon spill (Section 8.4 Hydrocarbon Spill Response),and Table 124 OPEP Notifications.	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	13-04-2023	Email TO relevant person	TGS replied to DNP's email received 06/04/2023 thanking them for their response regarding the Otway 3D marine seismic survey they are currently planning. In summary, TGS replied: - TGS currently reviewing EP and aware of sensitivities with control measures to prevent or avoid harm of the different receptors. - Site and acoustic source specific underwater modelling is being used in the assessment process and control measure and mitigation zone development. - Control measures will be in place to avoid impacts to southern right and pygmy blue whales, working with specialist. - Majority of survey area is in deep water with commitment remain deeper than 1000 m on eastern side of area to avoid potential impacts or conflicts with the giant crab fishery. - Working with other operators to consider cumulative impacts. - A commercial fisheries loss adjustment protocol is being developed. - The operational area has been significantly reduced, reducing the active source area and survey duration. - Survey will not run >400 days over EP duration with a maximum 200 days in any single year. - TGS welcomed the opportunity to provide feedback on the Parks Australia guidance note received in March. - DNP is on the notification list for any oil/gas pollution incident. - All other concerns are addressed in more detail in the EP. TGS closed the email by thanking DNP for their time and providing a response and advised that once the EP is accepted by NOPSEMA as complete, there is a 30 day public consultation period and offered to send a copy of the EP to DNP at that stage. Refer to Appendix H for detailed submission.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	14-04-2023	Email FROM relevant person	DCCEEW (DNP) replied to TGS' response emailed 13/04/2023 thanking them for their response and asked to be notified with the EP is out for public consultation.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	27-04-2023	Email TO relevant person	TGS replied to DCCEEW's email received 14/04/2023 advising they've added them to the action list to receive a copy of the EP once available for public consultation. TGS closed the email by advising DCCEEW to contact TGS if any further queries and thanking them for their help.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	10-05-2023	Email TO relevant person	TGS emailed DCCEEW as suggested by the Blue Whale Study Inc representative regarding control measures for southern right whales. TGS said they would really appreciate a meeting to discuss the measures and would provide an overview of the proposed survey. TGS provided an information sheet for more details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	26-05-2023	Email TO relevant person	TGS emailed DCCEEW to follow up on their email sent 10/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS said they would appreciate a meeting if they have time to discuss.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	29-05-2023	Email TO relevant person	TGS emailed DCCEEW to ask whether a meeting on 30/05/2023 would suit them otherwise would be later in the week.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	29-05-2023	Email TO relevant person	TGS replied to DCCEEW's email received earlier that day thanking them and asking them to advise when they are available the following week so TGS can set up a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	29-05-2023	Email FROM relevant person	DCCEEW replied to TGS' email sent earlier that day regarding a suitable meeting date. DCCEEW advised they will be unavailable for the rest of the week but will endeavour to get some information on the south-east austrlian southern right whale population to them as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	1-06-2023	Email TO relevant person	TGS emailed DCCEEW to confirm a meeitng next week and will contact again soon about a suitable time.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	1-06-2023	Email FROM relevant person	DCCEEW replied to TGS' email sent earlier that day regarding a suitable meeting date. The DCCEEW representative advised they are no longer within the Victorian department but can assist with some helpful information, providing a link to the southern right whale recovery plan which is currently being updated. DCCEEW advised a draft copy of the plan has been released for public comment and includes the mose up to date information on the east Australian population. DCCEEW added they are currently reviewing the BIAs, finalising the BIAS for the southern right whale and will let TGS know when they are published.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	1-06-2023	Email TO relevant person	SLR replied to DCCEEW's email received earlier that day thanking them.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	2-06-2023	Email FROM relevant person	DCCEEW emailed SLR to advise the Australian Government has developed the draft National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong which may be useful as it contains a section on aerial surveys and photo-identification for the southern right whale.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	6-06-2023	Email TO relevant person	SLR emailed DCCEEW to thank them for the information they had provided recently and keeping them informed of the BIA revisions. SLR asked if they had an idea of when the revised BIAs would be published. SLR advised they are hoping to arrange a meeting to discuss their proposed marine mammal control measures for their proposed marine seismic survey and said DCCEEW would be most welcome to join, providing suggested meeting date and time.	N	N/A	* (see note above table)	Continuing consultation.
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	6-06-2023	Email FROM relevant person	DCCEEW replied to SLR's email sent earlier that day to coordinate a meeting to discuss proposed marine mammal control measures for their marine seismic survey. DCCEEW advised they are not in a position to advise regarding the control measures but hoped there was enough information in the draft recovery plan but happy to answer specific questions. DCCEEW provided a link to the validated southern right whale sightings in Victorian waters. DCCEEW also advised they can't provide a precise indication of when the southern right whale BIAs will be published but hoping soon and they will advise SLR. DCCEEW advised they have logged a request for interested parities (including TGS) to be provided the BIAs as soon as they are publicy available. DCCEEW advised to use the existing BIAs for sourthern right whale to inform decision making (link to BIAs included).	N		* (see note above table)	Continuing consultation
Department of Climate Change, Energy, the Environment and Water (incl Director of National Parks)	7-06-2023	Email TO relevant person	SLR emailed DCCEEW with a further question to clarify southern right whale reproductive BIAs from the draft recovery plan and whether they are indicative of what the final version might be.	N	N/A	* (see note above table)	Continuing consultation.
Department of Defence (DoD)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Defence (DoD)	01-07-2022	Email FROM relevant person	The stakeholder advised that part of the proposed operational area is located within the South Australian Exercise Area (SAXA) and restricted airspace, and that unexploded ordnance (UXO) may be present on and in the sea floor. Additionally, TGS and Schlumberger are advised that: a. all activities in the area are conducted at their own risk; and b. the Commonwealth of Australia, represented by the Department of Defence, takes no responsibility for: i. reporting the location and type of UXO that may be in the areas; ii. identifying or removing any UXO from these areas; and iii. any loss or damage suffered or incurred by TGS and Schlumberger or any third party arising out of, or directly related to, UXO in the area. The stakeholder advised that in order to ensure activities do not conflict with Defence operations, Defence requests ongoing notification of activities prior to and during the proposed activities. The stakeholder asked TGS/Schlumberger to ensure that any activities undertaken within Restricted Airspace comply with the relevant Notice to Airmen (NOTAM) restrictions and to liaise with the airspace controlling agency if restricted airspace is activated. The stakeholder asked for continued liaison with the Australian Hydrographic Service (AHS) for Notices to Mariners (NOTMAR), in particular ensure that the AHS is notified three weeks prior to the actual commencement of activities.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Defence (DoD)	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Defence (DoD)	14-03-2023	Email TO relevant person	Resent email to an alternative email address obtained from another consultation database as email sent 14/02/2023 was undeliverable. Requested feedback be provided before 26/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Defence (DoD)	1-05-2023	Email TO relevant person	SLR emailed DoD requesting whether DoD can provide the WMS, shapefile or similar for the UXOs for those identified areas in the 'whereisuxo' interactive map. SLR advised this would be to check the proximity of any of the identified sites/locations to the proposed project area. SLR closed the email querying whether the email address used was the correct address for this query and to advise if there is another contact that should be used.	N	N/A	* (see note above table)	Continuing consultation.
Department of Energy and Mining (DEM)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Energy and Mining (DEM)	15-02-2023	Email FROM relevant person	Automated reply advising correspondence had been received and can expect response within 2-5 working days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Energy, Environment and Climate Action	13-06-2023	Email TO relevant person	SLR emailed DEECA regarding a query about southern right whale (SRW) sightings and liaising with coordinate citizen science platforms to better understand SRW distribution off the Victorian southwest coast as the breeding season progresses. SLR enquired about the potential for data sharing with exploration companies (sightings during seismic surveys) to inform operational activity, e.g. to direct the survey away from areas in which whales are known to be present.	N	N/A	* (see note above table)	Continuing consultation.
Department of Energy, Environment and Climate Action	13-06-2023	Email FROM relevant person	DEECA replied to SLR's email sent earlier that day regarding sharing whale sighting data to inform survey activity. DEECA explained some of the platforms available for sourcing data and the process and delays associated with publicly available sightings data through necessary analysis and validation. DEECA offered the possibility of more real-time data however this would be limited [compared with validated data set]. DEECA offered to provide information from coastal flights they will be carrying out soon however may be limited value for an offshore activity.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Department of Energy, Environment and Climate Action	15-06-2023	Email TO relevant person	SLR replied to DEECA's email received 13/06/2023 expressing interest in their offer to assist with providing information about southern right whales. SLR asked DEECA whether they need to formalise arrangements for exchanging information and said they would provide more information about the proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Department of Energy, Environment and Climate Action	15-06-2023	Email TO relevant person	SLR emailed DEECA a copy of the information sheet to provide them with background information about the marine seismic survey within the Otway Basin.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Energy, Environment and Climate Action	15-06-2023	Email FROM relevant person	DEECA replied to SLR's email sent earlier that day regarding sharing whale sighting data to inform survey activity. DEECA confirmed there is no need for a formal arrangement to share southern right whales sightings data advising they will send out a list of sightings as available and asked SLR to send a request to DEECA with the basic sighting update as needed and they can provide current sightings they have. DEECA asked SLR to also send any information to an additional DEECA email address (provided).	N	N/A	* (see note above table)	Continuing consultation.
Department of Energy, Environment and Climate Action	15-06-2023	Email TO relevant person	SLR replied to DEECA's email received earlier that day acknowledging their email and advising SLR will contact them as they progress through the approvals stage and once they have a start date for the marine seismic survey. SLR included the additional email address provided in DEECA's previous email as requested.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Infrastructure, Transport, Regional Development, Communication and the Arts	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Infrastructure, Transport, Regional Development, Communication and the Arts	16-02-2023	Email FROM relevant person	Automated email to TGS acknowledging email and advising will be directed to appropriate area in department.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Infrastructure, Transport, Regional Development, Communication and the Arts	17-04-2023	Email TO relevant person	TGS emailed DITRDCA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DITRDCA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Infrastructure, Transport, Regional Development, Communication and the Arts	17-04-2023	Email FROM relevant person	Automated email to TGS acknowledging email and advising will be directed to appropriate area in department.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Infrastructure, Transport, Regional Development, Communication and the Arts	24-04-2023	Email FROM relevant person	DITRDCA replied to TGS' email sent 17/04/2023 advising this department is not relevant with regards to their enquiry and included a reference to the Department of Climate Change, Energy, the Environment and Water 'Contact Us' page.	N	N/A - not relevant, suggested alternative government department.	N/A	Consultation closed
Department of Jobs, Precincts and Regions (DJPR) - Earth Resources Regulation (ERR)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Jobs, Precincts and Regions (DJPR) - Victorian Gas Program	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Jobs, Precincts and Regions (DJPR) - Victorian Gas Program	16-05-2022	Email FROM relevant person	Email undeliverable to 1 stakeholder email account	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Mining, Exploration and Geoscience (NSW)	22-05-2023	Email TO relevant person	TGS emailed DMEG seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from DMEG to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked DMEG to reply prior to 26/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Mining, Exploration and Geoscience (NSW)	22-05-2023	Email FROM relevant person	Automated email advising email TGS sent 22/05/2023 was undelverable.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Mining, Exploration and Geoscience (NSW)	8-06-2023	Email TO relevant person	TGS emailed DMEG to forward original correspondence emailed 22/05/2023 as noticed an error in the email address. TGS asked wheterh DMEG would like to receive additional information on their proposed marine seismic survey and whether they wish to be included within their consultation program (attached information sheet).	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (DNRET, formerly DPIPWE)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Map of survey relative to Tasmanian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (DNRET, formerly DPIPWE)	13-05-2022	Email TO relevant person	TGS state they are contacting DNRET to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, infoemation sheet and map presenting the survey relative to Tasmanian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation
Department of Natural Resources and Environment Tasmania (DNRET, formerly DPIPWE)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	3-03-2023	Email TO relevant person	TGS replied to DNRET's email sent earlier in the day requesting an extension whether they could have until 05/04/2023 to provide feedback and TGS replied yes and thanked them for keeping them updated.	N	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	3-03-2023	Email FROM relevant person	DNRET emailed TGS to apologise as urgent matters had arisen and the drafted comments to TGS regarding their proposed marine seismic survey are awaiting approval. DNRET asked if they could have until 05/04/2023 to provide TGS their department's comments and apologised again for any inconvenience.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	3-03-2023	Email FROM relevant person	DNRET replied to TGS' email sent earlier in the day thanking them for the extension.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	8-03-2023	Email FROM relevant person	DNRET replied to TGS' email dated 16/02/2023 providing information about the survey, advising they were in the process of reviewing the information provided and also seeking a deadline for when feedback is due. DNRET also provided preferred contact details within the Strategic Projects and Policy branch (email address provided) for further matters.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	13-03-2023	Email TO relevant person	TGS replied to DNRET's email dated 08/03/2023 requesting a deadline for feedback and acknowledging their response and correct contact details. TGS advised feedback is to be provided by COP 23/03/2023.	N	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	14-03-2023	Email FROM relevant person	DNRET replied to TGS' email dated 13/03/2023 providing a deadline of 23/03/2023 for feedback about the proposed survey. DNRET advised they have shared this information with the Department and will be in contact if they need further information.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	22-03-2023	Email TO relevant person	TGS replied to email received from DNRET earlier in the day requesting an extension to feedback deadline advising yes extension to 03/02/2023 is ok.	N	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	22-03-2023	Email FROM relevant person	DNRET replied to TGS' email dated 13/03/2023 regarding revised deadline for providing feedback on the survey. DNRET asked if they could please request an extension to feedback COB 03/04/2023 and commented they hope it does not cause any inconvenience to their team.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	4-04-2023	Email FROM relevant person	DNRET emailed TGS to provide a formal submission for the proposed Otway Basin 3D Marine Seismic Survey. DNRET recommended the following factors be considered and addressed during the EP development: - Seismic pulses are a known risk to marine mammals in vicinity of survey operations. - Difficult to identify a time period with minimum impact to cetacean species (in relation to various migration seasons). - Primary concern is impact to southern right whales (SRW) as showing limited signs of population increase - Portland area and aggregation area at Warrnambool in western Victoria and migration through western Bass Strait (including survey area) particularly important. - Any impact to SRW population likely to be significant due to their small population size. - Aware of consistent sightings of blue whales and other species in the Otway Basin from monthly aerial cetacean surveys by ConocoPhillips. CP indicated they could provide data set to TGS under MOU to inform TGS' EP (contact details provided). - King Island and NW Tasmania cetacean stranding record suggests survey area could be traversed by many other species at any time of the year. - DNRET supports TGS' commitment to implement control measures based on the EPBC Act Policy 2.1 Part B.4 at a minimum. - Indirect impacts of seismic activities should be considered for other top predators (e.g. shy albatross and Australian fur seal) - reference to important breeding period and prey species (cephalopds, pelagic fish) with particular mention of the shelf west of King Island and the Bonney Upwelling areas as important foraging areas. - Consideration of mitigating the impact of lighting on seabird species, given 24 hours operation and monitoring and reporting any impact. - Consideration of marine mammal detection during night time surveying or times with reduced visibility. - DNRET strongly recommends pro-active surveys or survey area to collect baseline information on species presence prior to and at the same time of the year the survey will be carried out to fulfill data gaps. Suggested PAM.	Y - Formal submission	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific claims raised by DNRET are set out in the following sections of the EP: Marine mammal detection and impacts: **Section 7.2.1.2.7** (animal movement and exposure modelling to acoustic disturbance), **Section 7.2.2.2.7** (imapcts of acoustic distrubance to marine mammals), **Table 84** (control measures for managing imapcts of acoustic disturbance) Shy albatross and Australian fur seal: adressed via various sections discussing sensitive ecological receptors and BIAs, and imapcts of planned and unplanned activities (**Section 4.4.4** BIA, **Section 4.5.6.3.2** Australian Fur Seal and **Section 4.5.7** seabirds and migratory shorebirds), and discussed in context of impacts of planned and unplanned activities (**Section 7.2.2.5.2** imapcts of underwater noise on BIA, **Section 8.3.3.2** impacts of hydrocarbon spills). BIA: **Section 4.4.4** (BIA), **Section 7.2.2.5.2** (imapcts of underwater noise on BIA), **Section 8.3.3.4** (impacts of hydrocarbon spills). Impact of lighting on seabird species: **Section 7.5.2.3** (impacts of artificial lighting on seabirds) Recommendation of pro-active surveys or survey area to collect baseline information: Section 9 sets of the approach and framework for assesment of cumualtive effects, which TGS are concurrently engaging with current operators and title holders to ensure the application of a meaningful proces to acknowledge and account for data gaps in cumualtive mapct assesment is adressed. Use of PAM: **Table 84** lists control measures for managing acoustic disturbance, and the use of PAM for night time operations. Ongoing consultation with DNRET will be undertaken in accordance with the methods set out in Section 5 to ensure DNRET have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	13-04-2023	Email TO relevant person	TGS replied to DNRET's email received 04/04/2023 thanking them for their detailed response that will inform their environment plan. TGS advised they are aware there is a wide range of sensitivities in the area and control measures which have been described and considered in the EP that is being developed. Other notes summarised below: - Underwater sound modelling has been performed to determine threshold noise sensitivity distances to prevent behavioural and acoustic impacts to a range of different species. - EP exceeds the normal control measures for marine seismic surveys to reflect sensitivities in the area and ensure compliance with the blue whale recovery plan and prevention of harm and disturbance to the BIA from acoustic noise. Includes restrictions on the seismic vessel operating during peak blue whale feeding season and the breeding season for southern right whales. - TGS has made a commitment to work with Blue Whale Study to undertake aerial surveys during the survey (led by BWS). - All requirements of the EPBC Act Policy 2.1 will be followed with additional measures to avoid impacts on marine mammals, e.g. marine mammal observers on both the survey and support vessel and increased mitigation zones (shutdown and observation). - Passive acoustic monitoring will be operating 24 hours per day for the duration of the survey. - Lighting measures will be in place, e.g. port holes will have closed curtains at night and only lighting necessary for safe navigation and working on deck will be used and directed inwards towards the vessel where possible. Any bird strikes will be recorded and notified if they occur. - All available information (including published literature, observations from previous surveys) has been collated to identify the likely marine mammal species in the area to incorporate in the EP. - TGS thanked DNRET for suggestion to contact ConocoPhillips regarding data sharing. TGS advised DNRET they have been discussing potential cumulative impacts with them and other proponents. TGS closed their email by asking DNRET to let TGS know if they have any further questions and advised that once the EP is submitted to NOPSEMA and accepted as complete, it will be publicly notified and available for submission for 30 days.	N	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	21-04-2023	Email FROM relevant person	DNRET replied to TGS' emailed sent 13/04/2023 thanking them for their reply and advising DNRET has no further comment and they look forward to receiving a copy of the EP. DNRET closed the email asking TGS to let them know when the EP has been published.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	27-04-2023	Email TO relevant person	TGS replied to DNRET's email received 27/04/2023 thanking them for their response and advising they have noted the Department has no further comment on the matter and added an action to notify them and send a copy when the EP is finalised. TGS closed the email advising DNRET to contact TGS if they have any further queries.	N	N/A	* (see note above table)	Continuing consultation.
Department of Natural Resources and Environment Tasmania (Strategic Projects and Policy Branch)	28-04-2023	Email FROM relevant person	DNRET replied to TGS' email sent 27/04/2023 thanking TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Planning and Environment (NSW)	9-05-2023	Email TO relevant person	TGS emailed DPE seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from DPE to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked DPE to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Planning and Environment (NSW)	9-05-2023	Email FROM relevant person	Automated email from DPE acknowledging the email TGS sent earlier that day advising they aim to respond within three working days and some enquiries may take longer based on their complexity.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Planning and Environment (NSW)	11-05-2023	Phone call TO relevant person	TGS called DPE (Gulag and Biamanga Joint Authority) to follow up on email sent 09/05/2023 but DPE advised they had not received the email and provided an alternative email address to resend to. DPE asked for TGS to call back next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Planning and Environment (NSW)	11-05-2023	Email TO relevant person	TGS emailed DPE to advise them of proposal to undertake the Otway Basin 3D Multi-client MSS. TGS advised they had been provided this contact from Merrimans Local Aboriginal Land Council. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why DPE was triggered as a potential relevant person as the area that may be affected overlaps with the southern NSW coast. TGS asked DPE to adivise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Planning and Environment (NSW)	12-05-2023	Email TO relevant person	TGS emailed DPE to advise them of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why DPE was triggered as a potential relevant person as the area that may be affected overlaps with the southern NSW coast. TGS asked DPE to adivise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Planning and Environment (NSW)	12-05-2023	Email TO relevant person	TGS replied to DPE's email received earlier seeking clarification on which team or area of department to send their email to. TGS said they are wanting it to be delivered to Parks and Wildlife so might be best delivered to environment. TGS asked for them to confirm this.	N	N/A	* (see note above table)	Continuing consultation.
Department of Planning and Environment (NSW)	12-05-2023	Email TO relevant person	TGS replied to DPE's email received earlier that day advising they are in contact with the Department of Climate Change, Energy, the Environment and Water and have also been in contact with the Gulaga and Biamanga Joint Authority at the suggestion of Merrimans Local Aboriginal Land Council. TGS advised they wanted to make the NSW department aware of their project also. TGS closed their email asking for DPE to let them know if they would like to be kept up to date or if they would like to be removed from the TGS consultation list.	N	N/A	* (see note above table)	Continuing consultation.
Department of Planning and Environment (NSW)	12-05-2023	Email FROM relevant person	Automated reply thanking TGS for their email and advising their query will be processed within 5 working days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Planning and Environment (NSW)	12-05-2023	Email FROM relevant person	DPE replied to TGS' email sent earlier that day asking for clarification on which team or area of the department they would like their email sent to - planning or environment.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Planning and Environment (NSW)	12-05-2023	Email FROM relevant person	DPE emailed TGS to advise their department is only responsible for NSW and recommended contacting the Department of Climate Change, Energy, the Environment and Water (link to website provided) at a federal level.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Primary Industries - Marine Environment (NSW)	22-05-2023	Email TO relevant person	TGS emailed DPI - ME seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from DPI - ME to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked DPI - ME to reply prior to 26/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	13-05-2022	Email TO relevant person	TGS state they are contacting PIRSA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and a map presenting the survey relative to South Australian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	28-06-2022	Email FROM relevant person	PDF attachment relating to correspondence on the the proposed survey area, which overlaps spatially and temporally with the South Australian Marine Scalefish, Giant Crab and Southern Zone Rock Lobster fisheries, which are important South Australian commercial fisheries. Any impacts may influence the sustainability of these fish stocks.	Y - formal response letter	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	14-02-2023	Email FROM relevant person	Automated email stating message was undeliverable for current contact email address.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	21-02-2023	Email FROM relevant person	PIRSA emailed TGS to provide formal correspondence for the proposed Otway Basin Seismic Survey. The letter acknowledged the distribution email delivered 14/02/2023.PIRSA advised the proposed survey area overlaps spatially and temporally with the SA Marine Scalefish, Giant Crab and Southern Zone Rock Lobster fisheries as well as the Commonwelath managed Southern Bluefin Tuna fishery of which are all important SA commercial fisheries and any impact may influence the sustainability of these fish stocks. PIRSA noted their previous correspondence (dated 28/06/2022) provided comment in relation to possible impacts from the survey and while the revised proposal (detailed in email delivered 14/02/2023) addresses these impacts, PIRSA recommend TGS continue to directly consult the South Eastern Professional Fisherman's Assn, the Marine Fishers Assn of SA and the Australian Southern Bluefin Tuna Industry Assn. PIRSA concluded letter with details for a direct contact within the PIRSA Fisheries and Aquaculture department.	Y - formal response letter	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Impacts of marine seismic survey on fishing activities: **Section 7.1.3.1** (impacts of the physical presence of the seismic survey vessels), **Section 7.2.3.1** (imacpts of acoustic disturbacne on fisheries), **Section 8.2.3** (imapct of streamer loss), **Section 8.3.4.1** (hydrocarbon spill), and **Table 84** includes control measures for adressing commercial fishers compensation in accordance with agreed protocols. Cumulative impacts and commercial fishers: **Section 9** sets of the approach and framework for assesment of cumulative effects, which TGS are concurrently engaging with current operators and title holders to ensure the application of a meaningful proces to acknowledge and account for data gaps in cumualtive imapct assesment is adressed. TGS will continue to consult with PIRSA and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	23-02-2023	Email TO relevant person	TGS acknowledged PIRSA's previous email including formal response, noting their comments and suggestion to continue to consult several listed fisheries direct. TGS advised PIRSA to contact TGS should they have any comments or queries regarding the survey in the future.	N	N/A	* (see note above table)	Continuing consultation.
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	17-05-2023	Online enquiry form submitted	TGS submitted an online enquiry advising they have been trying to consult with someone from PIRSA about their upcoming marine seismic survey within the Otway Basin and requested someone contact them so TGS can provide further information to determine if PIRSA would like to continue consultation (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Primary Industries and Regions South Australia (PIRSA) (includes South Australian Research and Development Institute (SARDI) Aquatic Sciences, aquaculture, commercial fishing, biosecurity, rec fishing and emergencies)	17-05-2023	Email FROM relevant person	PIRSA replied to online query advising they would reply shortly (provided reference number).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Transport (Vic)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Department of Transport and Planning (Vic)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Transport and Planning (Vic)	17-04-2023	Email TO relevant person	TGS emailed DTP to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DTP to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Department of Transport and Planning (Vic)	17-04-2023	Email FROM relevant person	Automated reply thanking TGS for contacting the DTP advising their query had been forwarded to the appropriate team within Safe Transport Victoria and to allow 7 - 10 business days for a response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Department of Transport and Planning (Vic)	18-04-2023	Email FROM relevant person	DTP replied to TGS' email sent 17/04/2023 thanking them for alerting them about their planned operations. DTP advised that as the survey is planned outside Victorian state waters they have no significant feedback or concerns. DTP offered to distribute a Victorian Notice to Mariners covering their activities if TGS would like. DTP continued this may be appropriate given significant offshore fishing occurs off Portland and they are happy to assist.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Department of Transport and Planning (Vic)	24-04-2023	Email TO relevant person	TGS replied to DTP's email received 18/04/2023 thanking them for their quick response confirming there was no significant feedback or concerns. TGS advised they would like to accept their offer to distribute Notice to Victorian Mariners and said they would note their offer and keep them updated with their progress and planning for notifications once confirmed. TGS closed their email thanking DTP for their support and assistance.	N	N/A	* (see note above table)	Continuing consultation.
Department of Transport and Planning (Vic)	24-04-2023	Email FROM relevant person	DTP replied to TGS' email sent 24/04/2023 advising they are happy to assist.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Devonport Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Devonport Council	16-02-2023	Email FROM relevant person	Acknowledgement of receipt of previous email advising the email has been forwarded to appropriate staff member for action/and or response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Devonport Council	17-04-2023	Email TO relevant person	TGS emailed DC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Devonport Council	17-04-2023	Email FROM relevant person	Acknowledgement of receipt of previous email advising the email has been forwarded to appropriate staff member for action/and or response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Discover Tasmania	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Discover Tasmania	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Discover Tasmania	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
District Council of Ceduna	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Ceduna	16-02-2023	Email FROM relevant person	Automated reply thanking TGS for contacting the DCC and confirming the email had been received and will be forwarded to the appropriate department for consideration and a response may be provided.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
District Council of Ceduna	17-04-2023	Email TO relevant person	TGS emailed DCC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DCC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Ceduna	17-04-2023	Email FROM relevant person	DCC replied to TGS' email earlier in the day stating their council is located on the far west coast of South Australia and does not wish to be on the consultation list.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
District Council of Ceduna	18-04-2023	Email TO relevant person	TGS replied to DCC's email sent yesterday advising they do no wish to be on the consultation list. TGS advised they have removed them from the consultation list.	N	N/A - do not wish to be consulted.	N/A	Consultation closed
District Council of Grant	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why DCG was triggered as a potential relevant person as the area that may be affected overlaps with the southern SA coast. TGS asked DCG to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Grant	4-05-2023	Email FROM relevant person	Automated reply email acknowledging TGS' email sent earlier that day advising the email has been forwarded to the appropriate staff to respond.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
District Council of Lower Eyre Peninsula	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Lower Eyre Peninsula	17-04-2023	Email TO relevant person	TGS emailed DCLEP to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DCLEP to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Lower Eyre Peninsula	17-04-2023	Email FROM relevant person	DCLEP replied to TGS' email earlier in the day stating their council is located on the Eyre Peninsula in South Australia approximately 450 km west of Robe. DCLEP advised that given the distance from the proposal, they have no comments to make.	N	N/A - no comments to make given distance from proposal	N/A	Consultation closed
District Council of Lower Eyre Peninsula	18-04-2023	Email TO relevant person	TGS replied to DCLEP's email received yesterday advising they have no comments to make regarding the proposal. TGS thanked DCLEP.	N	N/A	N/A	Consultation closed
District Council of Wattle Range	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS advised they have undertaken modelling to identify where that may be to help direct who they need to consult and why DCWR was triggered as a potential relevant person as the area that may be affected overlaps with the southern SA coast. TGS asked DCWR to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
District Council of Wattle Range	4-05-2023	Email FROM relevant person	Automated reply email acknowledging TGS' email sent earlier that day advising the email will be forwarded to the relevant Council Officer for information and action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Diving Industry Of Victoria Association Inc	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Diving Industry Of Victoria Association Inc	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Diving Industry Of Victoria Association Inc	17-04-2023	Email TO relevant person	TGS emailed DIVA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DIVA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Diving Industry Of Victoria Association Inc	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Dorset Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Dorset Council	16-02-2023	Email FROM relevant person	Automated reply acknowledging email and advising will respond as quickly as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Dorset Council	17-04-2023	Email TO relevant person	TGS emailed DC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked DC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Dorset Council	17-04-2023	Email FROM relevant person	Automated reply acknowledging email and advising will respond as quickly as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
East Gippsland Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
East Gippsland Shire Council	16-02-2023	Email FROM relevant person	Automated reply email thanking TGS for email and advising the enquiry would be assessed and where necessary scheduled for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
East Gippsland Shire Council	17-04-2023	Email TO relevant person	TGS emailed EGSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked EGSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
East Gippsland Shire Council	17-04-2023	Email FROM relevant person	Automated reply email thanking TGS for contacting EGSC and advising their aim is to respond via call back or return email within 10 business days or 30 business days if the matter is of a complex nature.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
East Gippsland Shire Council	5-05-2023	Phone call TO relevant person	SLB called EGSC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative confirmed they had received the email and has been forwarded to the relevant department and they would respond in due course, typically within 10 days of receiving the notice.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
East Gippsland Shire Council	10-05-2023	Phone call TO relevant person	SLB called EGSC to follow up on previous phone call made 05/05/2023 regarding their marine seismic survey proposed for the Otway Basin. EGSC reception advised the best person to speak to within the Environmental Sustainability department, although that person was not available today. EGSC advised they would provide them a message to call SLB back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
East Gippsland Shire Council	17-05-2023	Email FROM relevant person	EGSC emailed TGS in response to TGS' email sent 16/02/2023 advising that given the proposed site location, that works are located within the Commonwealth water and will be undertaken in accordance with the Offshore Pertroleum and Greenhouse Gas Storage (Environment) Regulations 2009, EGSC do not wish to provide further comment.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
East Gippsland Shire Council	17-05-2023	Phone call TO relevant person	SLB called EGSC to follow up on previous phone call made 10/05/2023 regarding their marine seismic survey proposed for the Otway Basin. EGSC advised that given the survey so far offshore EGSC don't forsee any issues or have any further concerns. EGSC said they would confirm this with management and provide a written response to TGS email.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
East Gippsland Shire Council	14-06-2023	Email TO relevant person	TGS emailed EGSC acknowledging their response TGS received 17/05/2023. TGS apologised for the delay in acknowledgement and reassured EGSC planning and works will be carried out in accordance with the Offshore Pertroleum and Greenhouse Gas Storage (Environment) Regulations 2009. TGS advised EGSC their comments have been noted in their consultation register and TGS has updated their records. TGS closed the email asking EGSC to get in contact if they have any queries arise.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	27-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	14-03-2023	Phone call TO relevant person	SLB called EMAC but there was no answer. SLB left a voice message offering to discuss the project further to call back at their earliest convenience.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Maar Aboriginal Corporation	20-03-2023	Phone call TO relevant person	SLB called EMAC but there was no answer. SLB left a voice message offering to discuss the project further to call back at their earliest convenience.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Maar Aboriginal Corporation	24-03-2023	Phone call TO relevant person	SLB called EMAC but there was no answer. SLB left a voice message offering to discuss the project further to call back at their earliest convenience.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Maar Aboriginal Corporation	27-03-2023	Email TO relevant person	SLB emailed EMAC to introduce themselves and advise they are partnering with TGS who are leading plans to conduct a marine seismic survey in the Otway Basin to commence later this year. SLB advised EMAC they have been trying to contact EMAC and have left several voice messages on a phone number listed on the EMAC website. SLB attached the factsheet for the proposed project and advised they hoped this would prompt further discussions regarding any concerns EMAC may have regarding the proposed survey. SLB asked EMAC to advise if they had some time to discuss or a short online meeting to present the survey and closed the email by stating they look forward to hearing from them.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	21-04-2023	Email TO relevant person	SLB emailed EMAC to follow up on previous emails sent 27/02/2023 and 27/03/2023 (copy included in email) regarding their proposed marine seismic survey in the Otway Basin. SLB advised they have developed a shorter, more concise factsheet which provides an explanation of why SLB is wanting to consult with EMAC. SLB also advised the factsheet also highlights aspects about the survey and potential effects on the environment, some of the measures in place to limit the potential effects and safeguards in place should an unexpected event occur. SLB said they would really like to meet with EMAC and anyone in their corporation that might be interested to hear about SLB's plans and hear any EMAC's concerns. SLB suggested they could arrange an online meeting at their convenience to discuss.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	26-04-2023	Email TO relevant person	SLB emailed an alternative contact for EMAC found online on the Office of Registrar of Indigenous Corporations. SLB advised they are partnering with TGS who are leading plans to conduct a marine seismic survey in the Otway Basin, commencing later this year. SLB advised they have been trying to contact with EMAC and have left several voice messages from a number on the EMAC website. SLB attached the latest information sheet to prompt further discussions with EMAC regarding any concerns they may have regarding the proposed survey. SLB closed the email by asking EMAC to let them know if they had time to discuss or for SLB to present the survey.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	1-05-2023	Email TO relevant person	SLB emailed another alternative contacts for EMAC obtained from the Office of Registrar of Indigenous Corporations advising they were trying to reach EMAC (included forwarded email sent to EMAC 26/04/2023) to consult further on their proposed marine seismic survey. SLB asked if they would be free for an online meeting where they could present the project which woud include the ongoing environmental planning activities. SLB attached the information sheet to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	5-05-2023	Email TO relevant person	SLB emailed the same contacts for EMAC they emailed on 01/05/2023 following up on that previously sent email, asking if they were available for an online meeting where they could present and discuss their project details with EMAC. SLB attached the information sheet to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	11-05-2023	Phone call TO relevant person	SLG called EMAC following discovery of an alternative contact on the Office of Registrar of Aboriginal Corporations website, however SLB were asked to leave a message. SLB left a message requesting someone call them back to discuss their proposed marine seismic survey and follow up on the various emails sent and phone calls made previously.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Maar Aboriginal Corporation	18-05-2023	Phone call TO relevant person	SLG called EMAC to follow up on previous communications regarding their proposed marine seismic survey. However there was no answer so SLB left a voice mail message requesting someone call them back to discuss their proposed marine seismic survey and follow up on the various emails sent and phone calls made previously.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	19-05-2023	Email TO relevant person	TGS emailed EMAC thanking them for contacting them through social media application. TGS advised they are planning a trip to Victoria week commencing 29/05/2023 and would really appreciate a meeint during that time, or alternatively an online meeting. TGS forwarded the previous emails sent to EMAC to provide the background information and left contact details if EMAC would prefer a phone call.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	19-05-2023	Letter TO relevant person	TGS posted a registered letter to EMAC advising of TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS enclosed an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided as soon as possible.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	23-05-2023	Email TO relevant person	TGS emailed EMAC asking whether they would be available for a meeting either 30/05/2023 or 31/05/2023 to discuss their proposed seismic survey. TGS advised their availability in either Warrnambool or Melbourne to go through the details with them, alternatively can arrange an online meeting.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	26-05-2023	Email TO relevant person	TGS replied to EMAC's email received earlier that day confirming they will arrange a meeting for 02/06/2023 and will send out a meeting invite. TGS closed their email advising they look forward to meeting them.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	26-05-2023	Email TO relevant person	TGS emailed an online meeting invite to EMAC for 02/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Eastern Maar Aboriginal Corporation	26-05-2023	Email FROM relevant person	EMAC replied to TGS's email regarding a meeting to discuss their proposed marine seismic survey. EMAC asked if they could set up an online meeting suggesting either 02/06/2023 or 05/06/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Maar Aboriginal Corporation	2-06-2023	Meeting with relevant person	TGS, SLB and SLR met with EMAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with EMAC: - EMAC queried the reason and purpose of the survey. - EMAC is uncomfortable with seimic surveying due to large international companies coming and going without any thought to longer term impacts. - Great risk to community compared with risks faced by companies. - Marine fauna observer integrity. - Wide mistrust in the community and activity doesnt employ local people. - Biocultural values most likely aren't being addressed in any studies that are part of the proposal. - Concerned about potential impact to important species, including eels. - Concerned with impacts of sharing information with companies. EMAC concluded the meeting by stating they would appreciate any additional information TGS could provide them. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific claims addressed in the EP are: Marine fauna observer integrity: **Section 10.3.5** MFOs and PAM Operators, detailing professional standards required. Biocultural values: Impacts to culture and heritage, as well as socio-economic imapcts are disscussed in detail in **Section 7.1.3** (Physical presence), **Section 7.2.3** (Acoustic imapcts), **Section 8.1.3** (Unplanned activities), **Section 8.3.4** (hydrocarbon spill) Impact to important species: **Section 7.2.2** (acoustic impacts), **Section 7.2.3** (routine permissible waste discharges), **Section 7.4.2** (atmospheric emissions), **Section 7.5.2** (artificial light emissions), **Section 8.1.2** (IMS), **Section 8.2.2** (streamer loss), **Section 8.3.3** (vessel collision and hydrocarbon spill), **Section 8.5.2** (accidental release of hazardous and non-hazardous materials). Remaining concerns will be subject to ongoing consultation. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Eastern Maar Aboriginal Corporation	14-06-2023	Email TO relevant person	TGS provided EMAC with a copy of the presentation and minutes from their meeting helf 02/06/2023 for their review and record. TGS also provided a list of the marine fauna considered within their environmental planning and environment plan. TGS also advised the marine fauna observer they discussed during the meeting would be willing to meet with them and asked EMAC to advise if they would like TGS to arrange a meeting. TGS closed the email thanking EMAC for their time and information and asked them to get in touch if they had any amendments, would like additional information or have and queries.	Y - Meeting minutes and copy of the presentation	N/A	* (see note above table)	Continuing consultation.
Eastern Zone Abalone Industry Association	09-06-2022	Meeting with relevant person	Stakeholder joined the meeting as a member of Seafood Industry Victoria (SIV). 'The stakeholder explained that they represents 1 of the 3 abalone zones in Victoria, being the Eastern Zone Abalone Industry Association, which covers the Victorian Coast from Lakes Entrance to Mallacoota. TGS / Schlumberger explained that they will manage the activity in accordance with Diving Medical Advisory Committee (DMAC) guidelines, whereby notifications will be provided to diving groups (such as abalone) with potential to dive within 45 km of the seismic survey, and groups can be involved in the risk assessment process where divers are within 30 km of the seismic survey. The stakeholder queried if seabed vibrations could affect the habitat of the abalone and how far the sound may travel and if it would impact on the abalone. TGS/Schlumberger/ERM clarified that due to the distance offshore and the deep water depths, sound propagation or seabed vibration inshore to areas where diving may occur (<30 m depth) is unlikely to have a significant effect on divers and Abalone are not expected to be impacted. The stakeholder raised that abalone around Portland are currently being impacted by the abalone viral ganglioneuritis (AVG) making them more susceptible to other external stressors. TGS/ Schlumberger/ERM confirmed that they are currently undertaking noise modelling to determine the extent of sound propagation. TGS/Schlumberger explained that they intend to consult with the Abalone Council of Australia and Abalone Council Victoria given the DMAC (2019) guidelines discussed previously. The stakeholder confirmed that they are on the board of Seafood Industry Victoria (SIV) and provided the name of the Independent Chair. TGS/Schlumberger/ERM confirmed that they are eager to speak with SIV regarding Victorian fisheries interests and will reach out again for a separate call.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Eastern Zone Abalone Industry Association	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for their attendance at the meeting.	Y - Summary meeting notes	N/A	* (see note above table)	Continuing consultation.
Eastern Zone Abalone Industry Association	23-06-2022	Email FROM relevant person	AIA declined an invitation to a stakeholder meeting scheduled for June 29th 9:00-10:00am AWST.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Eastern Zone Abalone Industry Association	26-04-2023	Email TO relevant person	TGS emailed EZAIA to reconnect and advise of changes to the survey (area size and contact details). TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked EZAIA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Zone Abalone Industry Association	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eastern Zone Abalone Industry Association	22-05-2023		EZAIA replied to TGS' email sent 19/05/2023 with questions for TGS: - what is the purpose of the surveys; - who has commissioned the activity to take place: - what would prospective clients be looking for by having the seismic data. EZAIA commented they are concerned the EMBA spreads in to their fishing area near the NSW border and although they don't envisage any impact to the abalone fihsing area of their members, they would like to be kept informed.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Eastern Zone Abalone Industry Association	22-05-2023	Phone call TO relevant person	SLB called EZAIA to follow up on previous correspondence sent to them regarding their proposed marine seismic survey. EZAIA confirmed they had received the emails and information TGS had sent to them. EZAIA's main comments included: - noted large size of EMBA which SLB explained is to direct consultation based EMBA. - query around introduction and spread of fish disease, however SLB explained the strict biosecurity measures they have to comply with. EZAIA suggested contacting the western abalone zone sector (provided contact details). EZAIA advised they had no major concners, were happy with the project as presented for now, have no other qeustions and don't need any further information at this stage. They advised they are attending an industry meeting soon and this will be discussed and will contact SLB if any queries. Refer to Appendix I for full submission details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eastern Zone Abalone Industry Association	24-05-2023	Email TO relevant person	TGS replied to EZAIA's response received 22/05/2023 thanking them for their information and providing them with the following information: - Purpose of survey to image subsurface geology. - TGS and SLB are acquiring the data as multi-client data with TGS leading the acquisition. - The data will be used for evaluating the area for hydrocarbon prospectivity. TGS then elaborated on how the EMBA was determined - using highly conservative modelling. TGS also explained some of the additional controls being used to minimise the risk of a release occurring. TGS closed their email confirming they will keep EZAIA informed as a relevant person.	N	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	29-03-2023	Email TO relevant person	TGS emailed ELALC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS asked if ELALC could advise the name of groups TGS may need to speak to in the lower NSW area to refine the list of who they contact, closing the email by advising any information would be very much appreciated.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	4-04-2023	Phone call TO relevant person	TGS called ELALC to follow up on email sent 29/03/2023 with information about their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message advising they were calling to discuss the proposed Otway survey and email sent on 29/03/2023 and to return their call (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	11-04-2023	Phone call TO relevant person	TGS called ELALC to follow up on email sent 29/03/2023 with information about their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message advising they were calling to discuss the proposed Otway survey and email sent on 04/04/2023 and to return their call (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	11-04-2023	Email TO relevant person	TGS emailed ELALC to follow up on email sent 29/03/2023 explaining they would really appreciate their help with providing any information about traditional owner groups in the lower coastal NSW area. TGS provided their direct mobile contact details for a call or suggested they can set up an online meeting to discuss. TGS closed the email by thanking ELALC.	N	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	17-04-2023	Phone call TO relevant person	TGS called ELALC to follow up on email and phone call from 11/04/2023 but there was no answer. TGS left a message to call them back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	1-05-2023	Phone call TO relevant person	TGS called ELALC to follow up on emails sent 29/03/2023 and 11/04/2023 and phone call made 17/04/2023 as had not received any response, however there was no answer. TGS left a message requesting they call TGS back and advised they'd follow up with an email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	1-05-2023	Email TO relevant person	TGS emailed ELALC to follow up on emails sent 29/03/2023 and 11/04/2023. TGS advised they are consulting to see if ELALC requires further information about TGS' proposed marine seismic survey within the Otway Basin to ensure ELALC can provide an informed response about whether the activity is likely to impact their functrion, interests or activities. TGS attached the information sheet and asked ELALC to let them know if they would like further information of have any queries.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	9-05-2023	Phone call TO relevant person	TGS called another ELALC representative after receiving alternative contact details from another relevant person to discuss their proposed marine seismic survey, however there was no answer. TGS left a message advising the purpose of the call and asked them to call them back, leaving contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	15-05-2023	Phone call TO relevant person	TGS called the new ELALC representative to follow up on their call and message left 09/05/2023 to discuss their proposed marine seismic survey, however there was no answer. TGS left a message advising the purpose of the call and asked them to call them back, leaving contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	22-05-2023	Phone call TO relevant person	TGS called the new ELALC representative to follow up on their call and message left 15/05/2023 to discuss their proposed marine seismic survey, however there was no answer. TGS left a message advising the purpose of the call and asked them to call them back, leaving contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	22-05-2023	Email TO relevant person	TGS emailed ELALC following their phone call and message left earlier that day. TGS advised they've been attempting gto correspond with them regarding their proposed marine seismic survey but have not received a response. TGS advised if ELALC has any input to let them know before 26/05/2023 so they can consider their information within the development of their environment plan before submitting to NOPSEMA soon. TGS asked ELALC to reply to the email if they have any questions or would like further detail.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	22-05-2023	Phone call FROM relevant person	ELALC returned TGS' call made earlier that day regarding their proposed marine seismic survey. ELALC asked if the caller was a TGS employee or a consultant and TGS confirmed they were from TGS. TGS said they would really appreciate their time to meet and would help with resourcing. ELALC called back later to confirm the ELALC Chair would attend an online meeting the following day and advised they would send a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	22-05-2023	Email FROM relevant person	ELALC sent TGS a meeting invite to meet with their Chair for the following day 23/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	23-05-2023	Meeting with relevant person	TGS, SLB and SLR met with ELALC to discuss their proposed marine seismic survey. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with ELALC: - Ballast water and the introduction of pests. - Impacts to marine fauna and flora - noise and physical presence. - Low likelihood of spill reaching NSW. - Marine fauna observers. - Current South Coast People Native claim - whether this is relevant or not. - Significance of marine animals within native people's culture. - ELALC has no concerns with survey. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Eden Local Aboriginal Land Council	23-05-2023	Message FROM relevant person	ELALC forwarded contact details to TGS for distributing meeting minutes.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Eden Local Aboriginal Land Council	25-05-2023	Email TO relevant person	TGS emailed ELALC minutes from meeting held 23/05/2023 for their review and record. TGS asked ELALC to advise if any changes or text needs removing. TGS thanked ELALC for their information and time. TGS advised ELALC of their plans to submit to NOPSEMA soon and the process following submission. TGS also said they would contact the relevant person ELALC suggested. TGS closed the email asking ELALC if they woud like to remain on TGS' consultation list or prefer to be removed so they don't receive any more communications.	N	N/A	* (see note above table)	Continuing consultation.
Eden Local Aboriginal Land Council	25-05-2023	Email FROM relevant person	ELALC emailed TGS and other ELALC members contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Elders Council of Tasmania Aboriginal Corporation	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS asked ECTAC to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Elders Council of Tasmania Aboriginal Corporation	5-05-2023	Email TO relevant person	[PLEASE NOTE - double up in correspondence, as an email was sent previous day also]. TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS asked ECTAC to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Elders Council of Tasmania Aboriginal Corporation	11-05-2023	Phone call TO relevant person	TGS called ECTAC to follow up email sent 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising they were following up on their email sent 04/05/2023 and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Elders Council of Tasmania Aboriginal Corporation	22-05-2023	Phone call TO relevant person	TGS called ECTAC to follow up email sent 04/05/2023 and phone call and message left 11/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising they were following up on their phone call and message left 11/05/2023 and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Elders Council of Tasmania Aboriginal Corporation	22-05-2023	Email TO relevant person	TGS emailed ECTAC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous correspondence. TGS asked if ECTAC has any input about the survey to let them know prior to 26/05/2023 so they can consider the information within the development of their environment plan before submitting to NOPSEMA for their review. TGS closed the email asking them to reply to the email if they have any queries or would like further details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Elders Council of Tasmania Aboriginal Corporation	1-06-2023	Email TO relevant person	TGS emailed ECTAC advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked ECTAC to advise if they have any queries about their consultation program so they can make sure ECTAC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where ECTAC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking ECTAC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Environment Tasmania	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environment Tasmania	17-04-2023	Email TO relevant person	TGS emailed ET to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ET to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environment Tasmania	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Environment Victoria	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environment Victoria	20-03-2023	Email FROM relevant person	EV responded to email from TGS sent earlier that day asking to elaborate on what the actual purpose of the seismic survey is and what the data will be used for, to determine if EV is a relevant stakeholder.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Environment Victoria	22-03-2023	Email TO relevant person	TGS responded to EV's email dated 20/03/2023 advising that TGS is a data and information company and the seismic data that TGS will acquire will be licensed to petroleum exploration companies for them to assess the prospectivity in the area. TGS advised to let them know if they would like to meet and discuss in more detail.	N	N/A	* (see note above table)	Continuing consultation.
Environment Victoria	17-04-2023	Email TO relevant person	TGS emailed EV to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked EV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environment Victoria	19-04-2023	Email FROM relevant person	EV replied to TGS' email sent 17/04/2023 thanking TGS for following up. EV advised they will have to decline their offer at this time and asked to remove Environment Victoria from TGS' consultation list.	N	N/A - declined offer to engage - requested to be removed from consultation list.	N/A	Consultation closed
Environment Victoria	27-04-2023	Email TO relevant person	TGS replied to EV's email received 19/04/2023 thanking them for their reply to TGS' previous email. TGS advised they would remove EV from their consultation list as requested and advised EV they can always contact TGS if they need further information or have any queries about the proposed survey.	N	N/A	N/A	Consultation closed
Environmental Protection Authority (EPA) - NSW	8-06-2023	Email TO relevant person	TGS emailed EPA - NSW seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from EPA to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS also provided information to help EPA provide feedback on the proposed survey, explaining EPA's rights and TGS' obligations through the consultation process. TGS asked EPA to advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet, NOPSEMA guidelines for consultation	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - NSW	8-06-2023	Email FROM relevant person	Automated email from EPA-NSW advising request will be processed within 5 working days.	N	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - NSW	8-06-2023	Email FROM relevant person	EPA - NSW replied to TGS' email sent earlier that day regarding their marine seismic survey within the Otway Basin. EPA advised they deal with pollution issues onshore in NSW only and have no jurisdiction over this project. EPA asked TGS to note in their records so they don't need to contact them when their project is not onshore in NSW.	N	N/A - not relevant, no jurisdiction	N/A	Consultation closed
Environmental Protection Authority (EPA) - NSW	9-06-2023	Email TO relevant person	TGS replied to EPA-NSW's email received the day before advising they have no jurisdiction over their project. TGS thanked EPA and advised they will make a note and remove EPA from their consultation program.	N	N/A	N/A	Consultation closed
Environmental Protection Authority (EPA) - South Australia	28-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Tasmania	16-02-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Tasmania	19-04-2023	Email TO relevant person	TGS emailed EPA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked EPA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Tasmania	28-04-2023	Email TO relevant person	TGS replied to EPA email received earlier that day thanking them for persisting and to let TGS know if they needed more information to help determine who might be most relevant contact within the EPA.	N	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Tasmania	28-04-2023	Email FROM relevant person	EPA emailed TGS to apologise for delay in response advising they haven't been able to find an interested party within the EPA and would be searching further a field.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Environmental Protection Authority (EPA) - Victoria	28-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Victoria	28-04-2023	Email FROM relevant person	Automated reply from EPA confirming EPA received their email and the customer service team will review for the appropriate action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Environmental Protection Authority (EPA) - Victoria	28-04-2023	Email FROM relevant person	EPA emailed TGS advising they have passed on their email sent earlier that day to the South West Victoria Regional Team with reference [reference provided].	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Environmental Protection Authority (EPA) - Victoria	1-05-2023	Email TO relevant person	TGS replied to EPA's email received 28/04/2023 thanking them for their help and confirming they will wait to hear back from someone in their SW Victoria Regional team.	N	N/A	* (see note above table)	Continuing consultation.
Environmental Protection Authority (EPA) - Victoria	1-05-2023	Email FROM relevant person	Automated reply from EPA confirming EPA received their email and the customer service team will review for the appropriate action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
First Nations Legal and Research Services (Victoria)	06-10-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures . TGS/Schlumberger explained that from published online resources that Native Title Consent Determination Areas are registered for the following Traditional Owner Groups: • Gunditjmara and Eastern Maar (Victoria); and • Eastern Maar (Victoria). TGS/Schlumberger asked the stakeholder to give advice as to whether the relevant Sea Country Groups are the same as the Native Title groups.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	10-10-2022	Email TO relevant person	TGS/SLB thanked the stakeholder for forwarding their query.	N	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	10-10-2022	Email FROM relevant person	The stakeholder explained that they have forwarded the email and information onto the relevant traditional owner group.	Y - Information Sheet - Area Co-ordinates	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Nations Legal and Research Services (Victoria)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	15-02-2023	Email TO relevant person	TGS acknowledged previous email from FNLRS and forwarding to the Gunditj Mirring Traditional Owners Aboriginal Corporation.	N	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	15-02-2023	Email FROM relevant person	FNLRS advised the email previously sent by TGS was forwarded to the Gunditj Mirring Traditional Owners Aboriginal Corporation.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Nations Legal and Research Services (Victoria)	5-05-2023	Email TO relevant person	TGS emailed FNLRS to thank them for their help and advise they are liaising directly with Gunditj Mirring Traditional Owners Aboriginal Corporation. TGS asked FNLRS whether they would like to be removed from the TGS consultation program or whether there are other groups they should be contacting.	N	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	5-05-2023	Email TO relevant person	TGS emailed a copy of the updated information sheet to FNLRS for their records.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
First Nations Legal and Research Services (Victoria)	5-05-2023	Email FROM relevant person	TGS received an out of office reply to their email sent earlier in the day advising they work Monday to Thursday and will be on leave on 08/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Nations of the South-East (FNSE)	17-04-2023	Email TO relevant person	TGS received an email from the alternative contact within SANTS they emailed earlier in the day, thanking TGS for their email. SANTS advised this is most likely to be of interest only to the First Nations of the South-East (FNSE) within SA and included the FNSE contact within the email who represents FNSE and is best placed to assist with any engagement including identifying interests or concerns.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
First Nations of the South-East (FNSE)	18-04-2023	Email TO relevant person	TGS emailed FNSE directly stating it would be great to set up a meeting with them next week if possible and asked them to advise when is convenient during the week.	N	N/A	* (see note above table)	Continuing consultation.
First Nations of the South-East (FNSE)	20-04-2023	Phone call TO relevant person	TGS called to follow up on proposed marine seismic survey and email from TGS that included FNSE sent on 17/04/2023,/. However FNSE was not available so TGS left a message to return call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Nations of the South-East (FNSE)	21-04-2023	Email TO relevant person	TGS emailed FNSE to follow up on email sent 18/04/2023 and advised they had tried calling FNSE yesterday and left a message. TGS asked FNSE to call them or alternatively TSG can set up an online meeting.	N	N/A	* (see note above table)	Continuing consultation.
First Nations of the South-East (FNSE)	22-05-2023	Email TO relevant person	TGS emailed FNSE to follow up on emails and phone calls from 27/04/2023 regarding their proposed marine seismic survey. TGS said that if FNSE has any input about the proposed survey to advise them before 26/05/2023 so the information can be considered within the development of the environment plan before submitting to NOPSEMA soon. TGS closed their email advising FNSE to contact them if they have any questions or would like any futher detail or reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
First Nations of the South-East (FNSE)	22-05-2023	Email FROM relevant person	FNSE replied to TGS' email sent earlier that day advising the email was provided and instructions were sought and they will continue to seek instructions.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Nations of the South-East (FNSE)	22-05-2023	Email TO relevant person	TGS replied to FNSE's email received earlier that day, thanking them.	N	N/A	* (see note above table)	Continuing consultation.
First Nations of the South-East (FNSE)	29-05-2023	Email TO relevant person	TGS emailed FNSE to follow up on their email received 29/05/2023 and whether they had any feedback from FNSE.	N	N/A	* (see note above table)	Continuing consultation.
First Tasmanians Aboriginal Corporation	29-03-2023	Email TO relevant person	TGS emailed FTAC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided by 05/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
First Tasmanians Aboriginal Corporation	4-04-2023	Phone call TO relevant person	TGS called FTAC to follow up on their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to advise they were calling about the proposed marine seismic survey in the Otway Basin and they had sent an email on 29/03/2023 and to call them back (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Tasmanians Aboriginal Corporation	11-04-2023	Phone call TO relevant person	TGS called FTAC to follow up on the phone call on 04/04/2023 and their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin. FTAC confirmed they would available for a meeting before the end of April and asked TGS to follow this call with an email as they were out of the office at the moment and they would get back with a suitable time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Tasmanians Aboriginal Corporation	11-04-2023	Email TO relevant person	TGS called FTAC following phone call earlier that day providing a copy of the original email sent to FTAC 29/03/2023. TGS said to let them know when they are available for a meeting before the end of April and they can set up and online meeting.	N	N/A	* (see note above table)	Continuing consultation.
First Tasmanians Aboriginal Corporation	26-04-2023	Phone call TO relevant person	TGS called FTAC to follow up on previous phone call and email sent on 11/04/2023 and to advise TGS will be visiting Tasmania next week and would FTAC be available for a meeting. FTAC advised they wouldn't be available for a meeting next week but agreed to an online meeting on 27/04/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Tasmanians Aboriginal Corporation	27-04-2023	Meeting with relevant person	TGS, SLB and SLR met with FTAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with FTAC: - Consultation with other First Nations groups. - Already great concerns with fish and wind farm applications. - There is awareness of issues and impacts to the ocean and wildlife. - Purpose of survey and seismic data. - Community benefits. - TGS' history of fuel spills > no spills and never occured within Australia. - Update on current status of project. TGS aked FTAC if there were any other groups they should be consulting and FTAC suggested several groups and TGS confirmed they are all being consulted with. Refer to Appendix I for detailed meeting minutes.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
First Tasmanians Aboriginal Corporation	16-05-2023	Email TO relevant person	TGS emailed FTAC to provide them with a copy of the minutes and presentation from their meeting held 27/04/2023. TGS also provided links to information as discussed during the meeting. TGS thanked FTAC for meeting with them and advised they will keep them posted as things progress and asked them to get in contact if they have any queries or amendments.	Y - Meeting minutes and copy of presentation	N/A	* (see note above table)	Continuing consultation.
Fisheries Research and Development Corporation (FRDC)	28-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Council	19-04-2023	Email TO relevant person	TGS emailed FC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked FC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Council	4-05-2023	Phone call TO relevant person	SLB called FC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative confirmed the email and factsheet had been received and reviewed and there were no comments from council.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	10-05-2023	Phone call TO relevant person	SLB called FC to follow up on phone call made 04/05/2023 regarding their marine seismic survey proposed for the Otway Basin. FC asked SLB to resend the information sheet originally sent (19/04/2023) and they would ensure it was forwarded to the relevant department for their feedback.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	11-05-2023	Email TO relevant person	SLB emailed FC following phone call with FC yesterday to resend the information sheet about their proposed marine seismic survey within the Otway Basin. SLB advised they would be grateful if they could forward to the relevant department within FC as discussed. SLB explained the reason for consultation is as part of the Environmental Plan also discussed during their previous phone call.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Flinders Council	17-05-2023	Phone call TO relevant person	SLB called FC reception who advised the best contact within FC regarding the proposed marine seismic survey and tried to transfer SLB to them, however there was no answer. FC confirmed they would follow up with that person and ask them to call SLB back.	N	N/A	* (see note above table)	Continuing consultation.
Flinders Council	17-05-2023	Phone call FROM relevant person	FC returned SLB's call from earlier that day regarding the proposed marine seismic survey within the Otway Basin. Both FC and SLB discussed the information sheet that had been sent through and FC commented they did not have any concerns or issues with the project plan however they would need management to approve before sending a formal response to TGS tomorrow.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Flinders Council	24-05-2023	Phone call TO relevant person	SLB called FC to follow up on previous communications regarding their proposed marine seismic survey within the Otway Basin and whether they had any feedback regarding the survey. FC reception advised they did not know the status of the information review or the persons that SLB had spoken to at FC. FC asked SLB to resend the information and they would action as soon as possible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	24-05-2023	Email TO relevant person	SLB emailed FC following phone call with FC earlier that day. SLB advised the original email was sent 11/05/2023 and they called the council 17/05/2023 and spoke to two FC employees of which one person advised they would provide formal feedback via email at the end of the previous week. SLB asked FC if they could please ask their team again for a response. SLB included the previously send email from 11/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Council	26-05-2023	Phone call TO relevant person	SLB called FC to follow up on previous communications regarding their proposed marine seismic survey within the Otway Basin and whether they had any feedback regarding the survey. FC queried why they were being consulted (given the distance). SLB explained how they have modelled the potential environment that may be affected (EMBA) from the worst-cased scenario - fuel spill release, which triggered SLB to contact FC. FC said they would discuss again and provide a response via email. SLB said they would resend the information sheet.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	30-05-2023	Phone call TO relevant person	SLB called FC to follow up on previous communications regarding their marine seismic survey proposed for the Otway Basin. SLB was the advised the person they wish to speak to is unavailable but the matter was being followed up and a response would be coming in the next day or two.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	1-06-2023	Phone call TO relevant person	SLB called FC to follow up on phone call made 30/05/2023 regarding their marine seismic survey proposed for the Otway Basin. The receptionist advised SLB the person they wish to speak to is unavailable but they would check the status and feedback should come through following that.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Council	1-06-2023	Phone call FROM relevant person	FC returned SLB's call from earlier that day regarding the proposed marine seismic survey within the Otway Basin. SLB explained the reason for their earlier call. FC confirmed they had received the information and had some questions and in general Council is opposed to all offshore oil and gas related activities and council would respond to that effect. FC enquired why they were receiving so many requests [from various proponents] for feedback recently. SLB explained the change in consultation requirements for developing an environmental plan, including that all feedback would be logged and presented to the regulator. SLB also advised the environment plan would be released for public consultation where any interested party can provide feedback or request further information. FC thanked SLB for the information and advised a formal written response will be provided to SLB tomorrow (02/06/2023).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Island Aboriginal Association Inc	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	14-03-2023	Phone call TO relevant person	SLB called FIAAI to follow up on factsheet emailed 16/02/2023.FIAAI advised they would review the factsheet and respond with any questions need. SLB thanked FIAAI for their help and confirmed they would call back in the future if no further feedback was received.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Island Aboriginal Association Inc	20-03-2023	Phone call TO relevant person	SLB called FIAAI to follow up on previous phone call on 14/03/2023. FIAAI asked SLB to resend the factsheet to generic email and they would review with the Department Lead (name provided) and get back to SLB. SLB advised the factsheet had been revised to better explain marine seismic surveying, the potential effects on the environment and measures SLB/TGS have in place to limit the potential effects and also the safeguards that will be in place should an unexpected event occur. FIAAI mentioned that due to the distance of the survey from their area of interest, there would not likely be any concerns and promised to get back to SLB following their review.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Island Aboriginal Association Inc	20-03-2023	Email TO relevant person	SLB emailed FIAAI following phone call earlier in the day. SLB provided the latest version of the factsheet for discussing with the FIAAI department lead. SLB advised they had developed the attached version for their planned marine seismic survey (MSS) which is more concise and provides an explanation of why SLB/TGS are wanting to consult with FIAAI in regards to the planned project. SLB also advised the factsheet highlights the aspects of the MSS and it's potential effects on the environment, the measures SLB/TGS will have in place to limit the potential effects and also the safeguards they will have in place should an unexpected event occur. SLB commented that from the previous phone call, they understand the survey plans may not be of concern to them due to the location of the survey and commented it would be great if they could provide that feedback once they have discussed so SLB can close out on the consultation register.	Y - Updated factsheet	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	28-03-2023	Email TO relevant person	SLB emailed FIAAI following up on phone call and last email sent to FIAAI on 20/03/2023. SLB asked to please let them know if they require further information or a call or meeting to discuss further.	N	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	3-04-2023	Email TO relevant person	SLB emailed FIAAI following previous unanswered emails and phone call, asking if they had any feedback regarding the proposed seismic survey and whether they had reviewed the information with the other FIAAI representative (name provided). SLB advised they would be happy to arrange an online meeting to update them if this is their preference. SLB included the previous two emails sent to FIAAI within the email and information sheet again.	Y - Updated factsheet	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	5-04-2023	Phone call TO relevant person	SLB called FIAAI to follow up on phone call from 20/03/2023 and subsequent emails to FIAAI. FIAAI advised she has not yet received feedback from their CEO. FIAAI wanted to clarify the project because of other communications they had received from another group about another marine seismic survey. SLB confirmed there was a second marine seismic survey in planning stages by another company and confirmed this survey was the TGS survey. FIAAI promised to follow up with their CEO again and get back to SLB. SLB suggested an online meeting with the CEO might be a good next event and FIAAI confirmed they would pass this on to the CEO.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Island Aboriginal Association Inc	11-04-2023	Email TO relevant person	SLB replied to FIAAI's emailed received earlier in the day, thanking FIAAI for their email. SLB said they just want to confirm they understand FIAAI's message and asked if FIAAI mean they do not have any remaining concerns or questions regarding the planned marine seismic survey and that no further consultation from SLB is needed going forward. SLB closed the email with thanks.	N	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	11-04-2023	Email FROM relevant person	FIAAI emailed SLB to advise their CEO has advised they do not wish to partake in the survey, closing the email with many thanks.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Flinders Island Aboriginal Association Inc	14-04-2023	Email TO relevant person	SLB emailed FIAAI to follow up on email sent 11/04/2023 asking for clarification on their email received 11/04/2023.	N	N/A	* (see note above table)	Continuing consultation.
Flinders Island Aboriginal Association Inc	20-04-2023	Phone call TO relevant person	SLB called FIAAI to follow up on email received 11/04/2023 to clarify the intent of that email. FIAAI confirmed the wording indicated that no further consultation was needed. SLB thanked FIAAI for their clarity and asked them to reach out if anything came to mind in the future or other concerns came to light.	N	N/A - no further consultation needed.	N/A	Consultation closed
Flinders Ports	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Flinders Ports	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Ports	19-04-2023	Email TO relevant person	TGS emailed FP to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked FP to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Flinders Ports	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Friends of the Bay of Islands Coastal Park	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Friends of the Bay of Islands Coastal Park	22-03-2023	Email FROM relevant person	FBICP replied to TGS' email sent 20/03/2023 advising that email has been forwarded on to the [individual] members FOBICP as the friends do not have a consensual statement on Seismic offshore survey. FBICP advised they have requested anyone who has an [opinion] to contact TGS with their feedback.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Friends of the Bay of Islands Coastal Park	26-03-2023	Email FROM relevant person	A FBICP member replied to TGS email sent to FBICP on 20/03/2023 thanking for the opportunity to engage with them. The FBICP member advised they are opposed to fossil gas exploration based on concerns relating to climate change and provided several references in support of their concerns.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Friends of the Bay of Islands Coastal Park	26-03-2023	Email FROM relevant person	A FBICP member replied to TGS email sent to FBICP on 20/03/2023 with two main concerns about the proposed activity: - lack of transparency and unproven effectiveness of TGS' environmental risk mitigation measures (on their website); and -TGS is a major participant in immoral and unethical supply-chain of fossil fuels. The member continued with the following questions: 1. Is the environmental impact assessment for this project publicly available. 2. If this is not publicly available, why not. 3. May the member be sent a copy. 4. TGS' website says 'the company employs protected species observers as a risk mitigation measure - what do these PSOs do. 5. Why are these observations not conducted by independent researchers. 6. Given the PSOs are employed by TGS, how can public be sure the data they collect is true, valid and not prejudiced because of their employment relationship to TGS. 7. Upon which scientific evidence are you basing risk mitigation measures and how do you know those measures are effective.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Friends of the Bay of Islands Coastal Park	27-03-2023	Email FROM relevant person	The FBICP President replied to TGS email sent to FBICP on 20/03/2023 advising they were replying as an individual as the group hadn't had time to meet. The FBICP member advised they are opposed to any future seismic activity occurring in the oceans to explore for opportunities for new or additional fossil fuel developments, citing the latest IPPC report on Climate Change (March 2023).	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Friends of the Bay of Islands Coastal Park	31-03-2023	Email TO relevant person	TGS replied to a FBICP member that emailed TGS on 26/03/2023 with concerns pertaining to climate change. TGS thanked the member for taking the time to correspond with TGS regarding the survey and acknowledged their issues and concerns raised. TGS clarified this proposed EP is to carry out a seismic survey to obtain geological data and does not include exploring for or producing oil or gas. TGS continued that would be a separate process and EP submitted by another proponent, requiring its own consultation and environmental assessments, independent of TGS. TGS added they are committed to protecting the environment, while operating in an environmentally sustainable and responsible manner and is why TGS wants to ensure their EP considers all environmental sensitivities and values within and around the survey area. TGS provided a link to their environmental policy and information about what TGS is doing to address climate risks and opportunities. TGS closed the email by thanking the FBICP member again for their time and feedback.	N	N/A	* (see note above table)	Continuing consultation.
Friends of the Bay of Islands Coastal Park	31-03-2023	Email TO relevant person	TGS replied to a FBICP member that emailed TGS on 27/03/2023 providing their comments to support their adamant opposition to any further seismic activity occurring in the oceans to explore opportunities for fossil fuel developments. TGS thanked the member for taking the time to correspond with TGS regarding the survey and acknowledged their issues and concerns raised. TGS clarified this proposed EP is to carry out a seismic survey to obtain geological data and does not include exploring for or producing oil or gas. TGS continued that would be a separate process and EP submitted by another proponent, requiring its own consultation and environmental assessments, independent of TGS. TGS added they are committed to protecting the environment, while operating in an environmentally sustainable and responsible manner and is why TGS wants to ensure their EP considers all environmental sensitivities and values within and around the survey area. TGS provided a link to their environmental policy and information about what TGS is doing to address climate risks and opportunities. TGS closed the email by thanking the FBICP member again for their time and feedback.	N	N/A	* (see note above table)	Continuing consultation.
Friends of the Bay of Islands Coastal Park	31-03-2023	Email FROM relevant person	The FBICP member that emailed on 26/03/2023 responded to TGS' response emailed 31/03/2023 thanking them for their response. The member commented that TGS does not mention what the purpose for the surveying is and they assumed it was for gas development but see it may be for offshore wind energy development and it makes a difference to them what industry the surveying is for. They do not wish to engage further if it would benefit a fossil fuel client and the fact further stages of development requiring consultation is semantics. The member asked whether TGS is able to disclose their client. The member's closing comments related to the staff of some consultancies being mindful of their own reputational risks and have decided not to work for fossil fuel companies as clients anymore, suggesting this is something for TGS to consider and advised everyone's corporate and personal decisions matter in this climate emergency.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Friends of the Bay of Islands Coastal Park	3-04-2023	Email TO relevant person	TGS replied to the FBICP member that emailed TGS on 26/03/2023 detailing specific concerns with the marine seismic survey. TGS answered their queries, including: - risk mitigation information is provided within the EP; - the EP is not yet available but will be publicly available once submitted to NOPSEMA); - what MFOs do; and - risk mitigation measures are based on scientific evidence (provided within the EP). TGS also acknowledged their issues and concerns and clarified this proposed EP is to carry out a seismic survey to obtain geological data and does not include exploring for or producing oil or gas. TGS continued that would be a separate process and EP submitted by another proponent, requiring its own consultation and environmental assessments, independent of TGS. TGS added they are committed to protecting the environment, while operating in an environmentally sustainable and responsible manner and is why TGS wants to ensure their EP considers all environmental sensitivities and values within and around the survey area. TGS thanked them for their time and feedback.	N	N/A	* (see note above table)	Continuing consultation.
George Town Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
George Town Council	19-04-2023	Email TO relevant person	TGS emailed GTC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked GTC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	19-04-2023	Email TO relevant person	TGS emailed GSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked GSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	9-05-2023	Phone call TO relevant person	TGS called GSC to follow up on email TGS sent 19/04/2023 regarding their proposed marine seismic survey within the Otway Basin. The GSC receptionist advised TGS they had not received the email and asked TGS to resend (address provided - same address that original email was sent to).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Glenelg Shire Council	9-05-2023	Email TO relevant person	TGS emailed GSC following their phone call earlier that day. TGS provided the email TGS sent to GSC 19/04/2023 including the information sheet and asked GSC to advise if they would like to discuss further or would like further information. TGS said alternatively to advise if their survey is not of interest or not relevant to GSC and they will remove them from their consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	15-05-2023	Phone call TO relevant person	TGS called GSC to follow up on phone call and email TGS sent 09/05/2023 regarding their proposed marine seismic survey within the Otway Basin. The GSC receptionist advised the person they need to speak to was away and took TGS' contact details for them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Glenelg Shire Council	17-05-2023	Email TO relevant person	TGS forwarded email to an alternative representative within GSC as suggested by another relevant person regarding their proposed marine seismic survey. TGS advised GSC they are visiting Portland 30/05/2023 and said it would be great to meet with them prior to that to provide details about their proposed survey. TGS closed the email by saying they understand thre representative is out of the office today but will try call them later in the week. TGS also provided their contact details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	18-05-2023	Email TO relevant person	TGS replied to GSC's email received earlier that day thanking them for their time and offered for them to get in contact if they wan any additional information in the furture.	N	N/A	* (see note above table)	Continuing consultation.
Glenelg Shire Council	18-05-2023	Email FROM relevant person	GSC replied to TGS' email sent the day before regarding their marine seismic survey thanking TGS for their notification and request to provide feedback. GSC advised they have no interests or activities that may be affected by the proposed survey. GSC added they understand the requirements to undertake this type of survey and at this time do not have any concerns or comments about the propose MSS as long as it follows and abides by Commonwealth laws as they are the governing body in this instance. GSC closed their email by advising that to their knowledge they have not been notified or received any requests or concerns from general public on the proposed and if they do receive any concerns or comments will direct them to TGS or other appropriate channels for feedback.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Great Australian Bight Right Whale Study	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	16-02-2023	Email FROM relevant person	Reply to previous email acknowledging email and advised will prepare a response prior to 16/03/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Great Australian Bight Right Whale Study	20-02-2023	Email TO relevant person	Acknowledgement email for previous email sent from GABRWS (received 16/02/2023) and offer to contact TGS if any queries in the meantime.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	19-04-2023	Email TO relevant person	TGS emailed GABRWS to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked GABRWS to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Great Australian Bight Right Whale Study	10-05-2023	Email TO relevant person	TGS emailed GABRWS as suggested by the Blue Whale Study Inc representative regarding control measures for southern right whales. TGS said they would really appreciate a meeting to discuss the measures and would provide an overview of the proposed survey. TGS provided an information sheet for more details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	26-05-2023	Email TO relevant person	TGS emailed GABRWS to follow up on their email sent 10/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS said they would appreciate a meeting if they have time to discuss.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	26-05-2023	Email FROM relevant person	GABRWS replied to TGS' emailed sent earlier that day thanking them for their email and apologising for the delayed response. GABRWS advised they are available for a meeting either 30/05/2023, 05/06/2023 or 06/06/2023 and they look forward to discussing further.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Great Australian Bight Right Whale Study	29-05-2023	Email TO relevant person	TGS replied to GABRWS' email received earlier that day asking if 8:30 am tomorrow morning would suit. TGS suggested they can send GABRWS an online meeting invite otherwise it will be later in the week.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	30-05-2023	Email FROM relevant person	GABRWS replied to TGS' email suggesting 05/06/2023 for a meeting to discuss the proposed marine seismic survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Great Australian Bight Right Whale Study	1-06-2023	Email TO relevant person	TGS emailed GABRWS to confirm a meeitng next week and will contact again soon about a suitable time.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	6-06-2023	Email TO relevant person	TGS emailed GABRWS and the DCCEEW to arrange a meeting to discuss their proposed marine mammal control measures for their proposed marine seismic survey providing suggested meeting date and time.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	6-06-2023	Email FROM relevant person	GABRWS replied to TGS' email sent earlier that day to coordinate a meeting to discuss propose marine mammal control measures for their marine seismic survey. GABRWS said they were unavailable for the suggested date and time but asked TGS to send through the proposed mitigation measures for review or engage the services of [consultant name] to advise on suitable mitigation measures to manage the potential impacts from their proposed activities. GABRWS advised while they are a relevant person for stakeholder engagement given their longterm research of southern right whales in southern Australia, they do not have the resources to prepare a detailed response. GABRWS advised their lack of response does not reflect the lack of concerns around TGS' activities and the potential impact to threatened and endangered marine fauna, their interests and activities for conducting long term research on southern right whales to inform national and international species assessments. GABRWS asked TGS to send through a scope of work for a proposal for [consultant name] to provide professional advice, if they'd like.	N	N/A	* (see note above table)	Continuing consultation.
Great Australian Bight Right Whale Study	8-06-2023	Email TO relevant person	TGS replied to GABRWS' email received 06/06/2023 asking TGS to send through proposed marine mammal control measures for review. TGS provided a summary of the proposed marine mammal control measures and attached an information sheet to provide an overview of the survey. TGS closed the email by asking GABRWS to contact TGS if they'd like to meet to discuss the control and welcome any feedback they have.	Y - Draft marrine mammal control measures and information sheet.	N/A	* (see note above table)	Continuing consultation.
Gulaga and Biamanga Joint Authority	9-05-2023	Email TO relevant person	TGS emailed GBJA providing information about their proposed marine seismic survey as promised. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from GBJA to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked GBJA to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Gulaga and Biamanga Joint Authority	11-05-2023	Phone call TO relevant person	TGS called GBJA to discuss their proposed marine seismic survey within the Otway Basin. GBJA advised they had not received the email sent 09/05/2023 but provided an alternative email address to forward the information to. GBJA advised they are quite busy this week and asked TGS to call back next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gulaga and Biamanga Joint Authority	11-05-2023	Email TO relevant person	TGS emailed GBJA following their phone call earlier that day providing information about their proposed marine seismic survey as promised. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from GBJA to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked GBJA to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Gulaga and Biamanga Joint Authority	15-05-2023	Phone call TO relevant person	TGS called GBJA to discuss their proposed marine seismic survey within the Otway Basin. GBJA advised they had read over the information and recommended she speak to the chairs of both the Gulaga and Biamanga groups to see if their boards would like to mee early June. GBJA said they would get an idea of the information they would request. TGS advised they can arrange an online meeting if preferred.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gulaga and Biamanga Joint Authority	19-05-2023	Email TO relevant person	TGS emailed GBJA following up their phone call 15/05/2023 regarding setting up a meeting with the Gulaga and Biamanga boards and would welcome a meeting early June. TGS asked for GBJA to advise if this would be convenient.	N	N/A	* (see note above table)	Continuing consultation.
Gulaga and Biamanga Joint Authority	24-05-2023	Phone call TO relevant person	TGS called GBJA to arrange a meeting date and time to discuss their proposed marine seismic survey with the Gulaga and Biamanga boards but there was no answer. TGS left a message for GBJA to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gulaga and Biamanga Joint Authority	26-05-2023	Phone call TO relevant person	TGS called GBJA to arrange a meeting date and time to discuss their proposed marine seismic survey with the Gulaga and Biamanga boards but there was no answer. TGS left a message for GBJA to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gulaga and Biamanga Joint Authority	6-06-2023	Email TO relevant person	TGS emailed GBJA advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked GBJA to advise if they have any queries about their consultation program so they can make sure GBJA can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where GBJA has the opportunity to review the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking GBJA to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Gulaga and Biamanga Joint Authority	6-06-2023	Phone call FROM relevant person	GBJA called following email TGS sent earlier that day asking if it was too late to submit a response regarding TGS' proposed marine seismic survey within the Otway Basin. TGS advised they will submitting their environmental plan mid-June so not too late and TGS will continue consultation following initial EP submission so they can discuss any concerns or queries.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	14-03-2023	Phone call TO relevant person	SLB called GLWAC to follow up on factsheet sent 16/02/2023. GLWAC advised they had reviewed the factsheet and had passed it internally for further comment. GLWAC confirmed they would review again and reply by email to SLB by COB 14/03/2023 if there were any concerns or need for further information regarding the survey. SLB thanked GLWAC for their help and noted they would wait for their email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	20-03-2023	Phone call TO relevant person	SLB called GLWAC to follow up on their phone call on 14/03/2023. The person whom answered the phone advised the GLWAC representative they were after was not available and to call back tomorrow.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	23-03-2023	Phone call TO relevant person	SLB called GLWAC to follow up on phone call from 20/03/2023.GLWAC advised they had reviewed the information and concluded the project was of no concern to their organisation due to the distant location from Gunaikurnai Lands. GLWAC advised she would respond formally via email today. SLB thanked GLWAC and offered to arrange a meeting if there remained concerns or interest going forward to explain the project and outline sensitivities and adaptive management processes discussed in the EP. GLWAC replied this would not be necessary.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	23-03-2023	Email TO relevant person	SLB replied to GLWAC's email sent earlier in the day advising they look forward to hearing back from GLWAC on Monday.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	23-03-2023	Email FROM relevant person	GLWAC emailed SLB to advise they need to get approval from their CEO for their draft response whom has been offsite and is now held up at a cultural session for all staff. GLWAC advised they would get to SLB on Monday (27/03/2023).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	5-04-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous emails and phone calls and spoke to reception who advised the previous person they had spoken to was not available today however, would be available tomorrow. SLB explained the previous correspondences and asked if the representative could be left a message to call their mobile tomorrow.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	14-04-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous emails and phone calls and spoke to reception who advised the previous person they had spoken to was not available but would ask them to call back later today.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	17-04-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous phone call made 14/04/2023. GLWAC advised they would like to receive a copy of the marine mammal sightings data that may be acquired during the marine seismic survey for their information. SLB confirmed this would be available and asked GLWAC to note this in their formal response via email.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	19-04-2023	Email FROM relevant person	GLWAC emailed SLB following their phone call on 17/04/2023 thanking SLB for respecting Aboriginal Culture and seeking feedback on their proposed seismic survey. GLWAC advised the area of the survey is not within the Gunaikurnai RAP or native title determination area which only extends 200 m offshore. GLWAC continued that no procedural/future act rights are activated under the Native Title Act. GLWAC closed their email advising that while they don't have any legal rights to the area, they would be interested in the data retrieved from the survey and trust SLB will be happy to share.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	19-04-2023	Email TO relevant person	SLB replied to GLWAC's email sent earlier in the day thanking them for confirming their earlier email and confirmed that as discussed, SLB will be compiling the sightings data following the conclusion of the survey as part of the environmental plan close out.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	21-04-2023	Email TO relevant person	SLB emailed GLWAC to advise they may have not been made aware of the potential risk associated with unplanned events (marine fuel discharge from the vessel) and the resulting environment that may be affected (EMBA). SLB attached an updated factsheet which includes this information and they apologised if they had not received earlier. SLB provided details about the modelling and advised it is extremely conservative and a collision with a seismic vessel has never occurred within Australia and possibly the world. SLB continued that the seismic operation is slow moving (7 km/hr) and includes at least two support vessels. SLB also noted notifications will be issued to mariners and they will be providing daily lookahead plans for the following 48 hr period to all those they are consulting as part of the EP. SLB closed the email advising they are happy to discuss the modelling to ease any concerns GLWAC may have. SLB closed the email apologising if this information has not reached them and to let them know if they would like to meet to discuss further.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	5-05-2023	Phone call TO relevant person	SLB called GLWAC to clarify information SLB had emailed earlier about the potential environment that may be affected (EMBA). SLB wanted to ensure GLWAC were aware of the EMBA and explain this is why SLB had consulted them. The GLWAC representative that SLB had spoken with earlier was not available so SLB left a message and requested them to call SLB back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	11-05-2023	Phone call TO relevant person	SLB called GLWAC regarding additional information SLB had sent GLWAC clarifying the EMBA and whether there was any additional feedback. GLWAC confirmed the inforrmation had been received and noted the likelihood of fuel spill occurring was extremely low and rarely occurred. SLB confirmed that was correct and commented on the other control measures employed to avoid a collision. GLWAC advised the factsheet had been sent to their legal department and would be discussed with their CEO and they would respond formally. SLB advised they would follow up with them if they hadn't heard back from them next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	18-05-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous phone call and message left on 11/05/2023 however they were unavailable. SLB left contact details and a message to return their call.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	23-05-2023	Phone call TO relevant person	SLB called GLWAC regarding additional information SLB had sent GLWAC clarifying the EMBA and whether there was any additional feedback from the corporation managment. GLWAC advised they had sought legal advice and were in the process of formalising a response, expected later today or tomorrow. GLWAC asked SLB to call again if they haven't received anything tomorrow. SLB thanked GLWAC for their continued support.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	29-05-2023	Email TO relevant person	SLB emailed GLWAC to follow up on previous correspondence to see if there was anything they would like to share in terms of remaning concerns or information needs regarding their proposed marine seismic survey. SLB said should GLWAC require anything further to please let them know or to resepond to this email.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	30-05-2023	Phone call TO relevant person	SLB called GLWAC to follow up pon previous email sent 29/05/2023 however they were unavailable. SLB left contact details and a message to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	1-06-2023	Phone call TO relevant person	SLB called GLWAC to follow up on phone call made the day before and asked to speak to GLWAC representative however they were unavailable. SLB left contact details and a message to return their call.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	7-06-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous phone call and message left on 01/06/2023 however they were unavailable. SLB left contact details and a message to return their call.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	8-06-2023	Phone call TO relevant person	SLB called GLWAC to follow up on previous phone call and message left on 07/06/2023 however there was a message advising the office was closed until 12/06/2023. SLB left contact details and a message to return their call.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	12-06-2023	Phone call TO relevant person	SLB called GLWAC to follow up on multiple phone calls made and emails sent earlier regarding their proposed marine seismic survey. GLWAC advised they were waiting for their CEO to responsed but will follow up tomorrow and send feedback to TGS.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	14-06-2023	Phone call TO relevant person	SLB called GLWAC to follow up on call made yesterday to discuss their proposed marine seismic survey, however there was no answer. SLB left a message to call back.	N	N/A	* (see note above table)	Continuing consultation.
Gunaikurnai Land and Waters Aboriginal Corporation RNTBC	14-06-2023	Phone call FROM relevant person	GLWAC called SLB back following their call and message left earlier that day. GLWAC commented that any concerns [regarding survey] are not likely to be listened to and offshore projects seem to proceed regardless. SLB explained the consultation process is designed to uncover all relevant person concerns and trigger update of survey control measures within the environment plan (EP). SLB explained NOPSEMA's process to review the EP and determine if approved or not. GLWAC explained their overriding concern to cultural heritage is if a spill occurred and fuel reached the beaches. SLB outlined the controls proposed to mitigate the risk of a spill occurring and low likelihood of occurrence. GLWAC acknowledged controls however reiterated their concern still remains. GLWAC agreed they would provide this information in an email for SLB's records and thanked SLB for their patience through the process.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Ongoing consultation with GLWAC will be undertaken in accordance with the methods set out in Section 5 to ensure GLWAC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	10-10-2022	Email FROM relevant person	Email from lawyer (FNLRS) acting for GMTOAC informing TGS that their email is being forwarded to GMTOAC.	Y - Attachment from TGS being forwarded	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	15-02-2023	Email TO relevant person	TGS replied to an email where FNLRS had included the GMTOAC in email as an RP. TGS invited GMTOAC for either an in-person or video meeting.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	15-02-2023	Email FROM relevant person	Automated reply to previous CC email advising reduced working hours until further notice. The email provided an alternative contact address.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	20-02-2023	Email TO relevant person	Forwarded original email forwarded to FNLRS on 15/02/2023 advising changes to survey and providing the updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	14-03-2023	Phone call TO relevant person	SLB called GMTOAC to follow up on email with factsheet sent to them on 20/02/2023 whom advised of the best GMTOAC representative. However that person was out of the office for the day. GMTOAC said they would leave the representative a message that SLB had called and to call SLB back 15/03/2023 to discuss survey further. SLB thanks GMTOAC for their help and noted they would wait for GMTOAC to call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	20-03-2023	Phone call TO relevant person	SLB called GMTOAC to follow up on email with information sent to them on 20/02/2023 and previous phone call on 14/03/2023. GMTOAC advised the person they need to speak to was in a meeting but took SLB's contact details to return call and advised SLB to call back tomorrow.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	21-03-2023	Phone call TO relevant person	SLB called GMTOAC to follow up on previous phone call on 14/03/2023 and subsequent attempts however the GMTOAC representative that SLB needed to speak to was unavailable. SLB left a message to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	21-03-2023	Email TO relevant person	SLB emailed GMTOAC as discussed on the phone earlier that day to provide the latest version of the factsheet to discuss internally. SLB advised the factsheet was more concise and provides: - an explanation of why they were wanting to consult with GMTOAC in regards to the planned project; - aspects of the marine seismic survey; - the potential effects on the environment; - the measures SLB/TGS have in place to limit potential effects; and - safeguards in place should an unexpected event occur. SLB mentioned from the phone call earlier that day, that they understand GMTOAC may prefer an online meeting in the future to update them on the project (potentially April) and they plan to let SLB know their preference. SLB said if GMTOAC do not wish to have an online meeting and they have no concerns with the survey, it would be great if they could provide that feedback to SLB/TGS so SLB can close out in their consultation register.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	21-03-2023	Phone call FROM relevant person	GMTOAC returned SLB's call from earlier that day. After introductions and summary of reason for the call (to discuss the proposed seismic survey), GMTOAC asked SLB if there were other seismic plans in the area as they had received other emails. SLB confirmed there may be interest in the shallow water from other providers. GMTOAC commented they thought they had already commented on the TGS/SLB survey, however would like to discuss further with management. SLB offered to email the latest revised factsheet for use with Traditional Owner groups and GMTOAC ask.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	23-03-2023	Email TO relevant person	SLB thanked GMTOAC for getting back to them, stating they appreciate the volume of requests they must be getting for consultation following the revised consultation guidelines from NOPSEMA released Dec 2022. SLB commented they believe the CGG project may be in shallower water areas offshore Victoria, however uncertain of details as they are not involved in that project. SLB asked GMTOAC if they would prefer for SLB to arrange a quick online meeting to update them on the TGS/SLB Otway 3D project (deepwater), advising they could schedule for next week at their convenience.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	23-03-2023	Email FROM relevant person	GMTOAC replied to SLB's email sent 21/03/2023. GMTOAC apologised for not getting back in touch advising they have so many people engaging with them and they are a little confused about who they have spoken to - having spoken to someone else about seismic surveys. GMTOAC advised they had received correspondence from CGG and asked how this relates to what SLB is doing.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	27-03-2023	Email TO relevant person	SLB emailed GMTOAC to follow up on email sent 23/03/2023. SLB asked whether the GMTOAC representatives they had been speaking with previously would be available for a call some time this week. SLB said they remember GMTOAC advised they had a busy schedule and travel but couldn't remember the details. SLB advised TGS and SLB can make themselves available to suit their calendar. SLB closed the email by thanking GMTOAC.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	28-03-2023	Email TO relevant person	SLB replied to GMTOAC's email earlier that day advising they will wait to hear back from them regarding a suitable meeting time.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	28-03-2023	Email FROM relevant person	GMTOAC responded to SLB's email sent 27/03/2023 advising they were away at the moment and when they return will look to confirm a day for a quick catch up, thinking Thursday morning as next week won't work. GMTOAC closed the email to advise they will be in touch.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	29-03-2023	Email TO relevant person	SLB replied to GMTOAC's email earlier that day just clarifying that 10:00 am was Eastern Standard Time.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	29-03-2023	Phone call TO relevant person	SLB called GMTOAC to confirm meeting proposed in earlier emails. GMTOAC advised they were waiting on confirmation from another attendee and asked for more information on what would be discussed at the meeting. SLB outlined the project presentation material and intention to listen to any concerns GMTOAC may have. GMTOAC explained their corporation represents the traditional owners however to carry out full consultation would require meeting with the full traditional owner group which would be impossible to facilitate. SLB advised the meeting intention was to gather information regarding values and sensitivities if GMTOAC could discuss then SLB/TGS could incorporate in the EP. GMTOAC asked SLB if they had engaged Eastern Maar traditional owners and SLB confirmed they had no success with replies to their emails or phone calls. GMTOAC confirmed they can be very hard to reach. SLB said it would be good to discuss in tomorrow's meeting and GMTOAC said she would confirm the time with their colleague.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	29-03-2023	Text message TO relevant person	SLB texted GMTOAC to ask if the meeting proposed earlier was still on for tomorrow (30/03/2023). GMTOAC replied they were no longer available tomorrow to meet and GMTOAC would respond to SLB in due course.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	29-03-2023	Email FROM relevant person	GMTOAC emailed to ask SLB whether tomorrow (30/03/2023) at 10:00 am would suit for a meeting.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	28-04-2023	Email TO relevant person	SLB emailed GMTOAC thanking them for the call earlier that day to let SLB know the scheduled meeting was to be cancelled/postponed. SLB said they fully understand their work commitments as explained and they look forward to picking up their discussion again in early June when the GMTOAC representatives are available. SLB closed the email advising they will get back in contact in May regarding confirming a date for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	28-04-2023	Phone call FROM relevant person	GMTOAC called SLB requesting the meeting arranged for today be cancelled or postponed due to excessive workload. GMTOAC explained the next few weeks GMTOAC will be preparing for a Native Titles meeting, in preparation for a court case in May. GMTOAC indicated the earliest availability is early June. SLB thanked GMTOAC for their call and informed them they will be meeting NOPSEMA next week with an update on their ongoing consultation with GMTOAC. SLB also committed to keeping in contact with GMTOAC in the coming weeks to confirm another day for their postponed meeting.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	5-05-2023	Email TO relevant person	SLB emailed GMTOAC asking whether GMTOAC has a date and time available to meet to discuss their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	5-05-2023	Email TO relevant person	SLB replied to GMTOAC's email received earlier that day confirming a meeting date and time and advised they would send out a meeting invite to confirm.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	5-05-2023	Email TO relevant person	SLB emailed an online meeting invite to GMTOAC for 06/06/2023 at 10:00 am.	N	N/A	* (see note above table)	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	5-05-2023	Email FROM relevant person	GMTOAC replied to SLB's email sent earlier that day suggesting a meeting date and time 06/06/2023 at 10:00 am.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Gunditj Mirring Traditional Owners Aboriginal Corporation	6-06-2023	Meeting with relevant person	TGS, SLB and SLR met with GMTOAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries and concerns with GMTOAC: - GMTOAC advised who they represent. - Need to consult with traditional owners and suggested with other proponents in combined session. - Concerns with impacts to whale and kooyang (eel) populations. - Deep rooted and historical connection with the sea country, only expressed by the GMTOAC people. - Purpose and reason for survey. - Impacts on the submerged tangible cultural heritage. - Potential for TGS to engage traditional owners in a training pathway. - Community meeting with other proponents and advice on presentation suitable for that meeting. - Understand reason for oil and gas exploration with global push to decarbonise. - Clarification on relationship with Eastern Maar people. - Unable to define extent of 'sea country'. GMTOAC advised they are in the process of developing guidance material for understanding cultural and historial context that will help explain connections with sea country. TGS discussed the potential for a visit later at the end of the month and will wait to hear from GMTOAC regarding a community meeting with their people. TGS advised they would provide GMTOAC with minutes and copy of presentation. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific claims addressed in the EP are: Purpose of the survey: **Section 1.2** (Purpose and objectives) Effects on marine mammals: **Section 4.5.6** (summary of existing knowledge of marine mammals), **Section 7.1.2.2** (effects of the physical presence of the Seismic Survey to marine mammals), **Section 7.2.2.2.7** (acoustic disturbance effects to marine mammals), **Section 8.3.3.2.5** (effects of a hydrocarbon spill to marine mammals) Cultural effects: **Section 4.6.1** (summary of existing knowledge of Aboriginal Heritage), **Section 8.3.3.3** (potential impacts and risks of hydrocarbon spill on cultural and heritage sites) Ongoing consultation with GMTOAC will be undertaken in accordance with the methods set out in **Section 5** to ensure GMTOAC have had both sufficient information, and sufficient time to engage in the consultation programme. Particular regard will be taken to ensure aspects realting to information provided by GMTOAC regarding cultural and historial context of sea country connections will be discussed. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Gunditj Mirring Traditional Owners Aboriginal Corporation	8-06-2023	Email TO relevant person	TGS emailed GMTOAC minutes and copy of the presentation from their meeting held 06/06/2023 and asked GMTOAC to advise of any amendments or text to be removed. TGS advised they have incorporated their comments and queries within their environmental and consultation planning and will update the environment plan to reflect the information GMTOAC provided. TGS added they look forward to meeting with the Gunditj Mirring people to share information and hear their stories. TGS closed their email thanking GMTOAC for their time and information and will be in contact regarding a vist later this month otherwise to contact TGS if they have any queries or need further information in the meantime.	Y - Meeting minutes and copy of presentation	N/A	* (see note above table)	Continuing consultation.
Huon Valley Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Huon Valley Council	16-02-2023	Email FROM relevant person	Automated repy acknowledging email and advising email will be forwarded to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Huon Valley Council	19-04-2023	Email to relevant person	TGS emailed HVC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked HVC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Huon Valley Council	19-04-2023	Email FROM relevant person	Automated reply acknowledging email and advising email will be forwarded to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Huon Valley Council	2-05-2023	Phone call TO relevant person	HVC called HVC to follow up on email TGS sent 19/02/2023 regarding their proposed marine seismic survey within the Otway Basin.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Huon Valley Council	2-05-2023	Email TO relevant person	TGS emailed HVC following phone call earlier that day. TGS said they will be in Hobart this week and would welcome the opportunity to meet with HVC to discuss their proposed offshore marine seismic survey to give a project update and hear if they have any concerns. TGS offered to alternatively set up an online meeting next week or call TGS direct (mobile phone number provided).	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Huon Valley Council	2-05-2023	Email FROM relevant person	Automated reply acknowledging email and advising email will be forwarded to the relevant department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Huon Valley Council	4-05-2023	Phone call TO relevant person	TGS called HVC to follow up on emails TGS sent 02/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS advised they are contacting relevant councils to see if they had any concerns or needed any further information. HVC advised they need to speak to the Infrastructure and Environment team.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Huon Valley Council	10-05-2023	Phone call TO relevant person	TGS called HVC to follow up on emails and phone calls TGS had sent regarding their proposed marine seismic survey within the Otway Basin. TGS was transferred to the planning team who advised they discussed the proposal and were happy no further action was needed and would like to be removed from the consultation list. TGS asked if HVC could email their position through for their records and HVC confirmed they would send an email.	N	N/A - no further action needed - remove from consultation list	N/A	Consultation closed
Huon Valley Council	15-05-2023	Email TO relevant person	HVC emailed TGS to follow up after their call on 04/05/2023 asking HVC to confirm TGS can remove them from their consultation list.	N	N/A	N/A	Consultation closed
International Fund for Animal Welfare	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
International Fund for Animal Welfare	20-03-2023	Email FROM relevant person	Automated reply from IFAW acknowledging email sent to them earlier that day confirming they had received TGS's enquiry and will be in touch as soon as possible (within 2 working days). The email provided their office hours and advised if query was urgent to call their free phone line (details provided) and leave a voice mail message for them to return the call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
International Fund for Animal Welfare	20-03-2023	Email FROM relevant person	IFAW replied to email sent from TGS earlier that day advising that due to capacity they are not able to provide a detailed submission on the project. The email continued that the lack of formal comment should not be taken as an endorsement of the work and for the record, IFAW has significant concerns about the impact of oil and gas exploration on the marine environment, particularly in regards to seismic testing and its harmful impacts on whales. IFAW commented they would like to see the development of quieter alternatives to seismic airguns to reduce underwater noise pollution and a moratorium on any further seismic surveying in Biologically Important Areas at times when whales are present in these areas. IFAW advised TGS to refer to IFAW's submission to the Senate Environment and Communications References Committee Inquiry into the impact of seismic testing on fisheries and the marine environment 2019.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
International Fund for Animal Welfare	27-03-2023	Email TO relevant person	TGS responded to IFAW's response on 20/03/2023 acknowledging their email. TGS said they understand their concerns and advised them they will be implementing a suite of extensive control measures well above the standard regulatory requirements that is based on validated underwater noise modelling by world class experts in this field to avoid any impact or interference on marine mammals, existing marine environment and other users. TGS closed the email by advising IFAW to contact TGS if they have any further questions or if they have capacity.	N	N/A	* (see note above table)	Continuing consultation.
Kangaroo Island Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Kangaroo Island Council	16-02-2023	Email FROM relevant person	Automated reply acknowledging receipt of email and advising the email will be actioned in the normal course of business.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Karadi Aboriginal Corporation (KAC)	14-03-2023	Phone call TO relevant person	TGS called KAC to follow up on the email and factsheet sent to them on 16/02/2023. KAC Reception advised whom the best person would be to speak to (contact details provided) but they were out of the office at that moment. TGS left a message to call them back or send an email when they were back in the office.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	22-03-2023	Email TO relevant person	TGS emailed KAC to provide them with an updated version of the factsheet which is more concise and provides an explanation of why TGS is wanting to consult with KAC on their planned project. TGS continued the factsheet explains what a marine survey is, what are the potential effects on the environment, the measures TGS has in place to limit the potential effects and safeguards in place should an unexpected event occur. TGS said they would like to meet KAC online to share TGS's plans and whether KAC has any concerns and can arrange an online meeting at their convenience to discuss. TGS closed the email by thanking KAC and advising they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Karadi Aboriginal Corporation (KAC)	27-03-2023	Phone call TO relevant person	TGS called KAC to follow up on email sent on 22/03/2023 and the receptionist advised the KAC representative was out of the office. TGS left a message for the representative to call back or send an email when they are back in the office.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	11-04-2023	Phone call TO relevant person	TGS called KAC to follow up on email sent on 22/03/2023 and there was no answer. TGS left a message for the representative to call back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	11-04-2023	Email TO relevant person	TGS emailed KAC to follow up on email sent on 22/03/2023 (provided copy of email). TGS advised they would like to meet online with KAC to discuss the proposed marine seismic survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss, or they can call them direct (mobile contact details provided). TGS closed the email by thanking KAC.	N	N/A	* (see note above table)	Continuing consultation.
Karadi Aboriginal Corporation (KAC)	11-04-2023	Email FROM relevant person	Automated reply to email TGS sent earlier that day advising out of the office until 26/04/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	26-04-2023	Phone call TO relevant person	TGS called KAC to follow up on email and information sheet sent to KAC on 22/03/2023 and to set up a meeting next week while TGS will be visiting Tasmania. However the KAC receptionist advised the person TGS has been attempting to liaise with was out of the office. TGS asked if there was an alternative contact. The receptionist suggested emailing the information to the office manager (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	26-04-2023	Email TO relevant person	TGS emailed the KAC office manager as suggested by the KAC receptionist following a phone call earlier that day. TGS advised they had been trying to liaise with the previous KAC contact regarding their proposed seismic project offshore in the Otway and the receptionist had advised contacting this person. TGS advised KAC they are planning a trip to Tasmania next week and would welcome the opportunity to meet and discuss the project and hear if KAC has any questions or concerns in regards to the project. TGS closed the email thanking KAC.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Karadi Aboriginal Corporation (KAC)	1-05-2023	Phone call TO relevant person	TGS called KAC to follow up on previous correspondence on 26/04/2023. The receptionist advised she had forwarded the information to the person TGS needs to speak to, however that person was not available but will be in the office the following day. TGS agreed to call back the following day.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	2-05-2023	Email TO relevant person	TGS emailed KAC advising they had called and left a message but following up now with an email. TGS advised they will be in Hobart this week and would be great to get some time with them to give an overview of their project and more importantly understand if they have any concerns.	N	N/A	* (see note above table)	Continuing consultation.
Karadi Aboriginal Corporation (KAC)	3-05-2023	Email FROM relevant person	KAC replied to TGS' email sent 02/05/2023 and apologised they don't have time to meet as they have been away and will be away for the next two weeks.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	22-05-2023	Phone call TO relevant person	TGS called KAC following up from their email received 03/05/2023 but the KAC representative was not available. TGS left a message for that person to return their call and advised they would send a follow up email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Karadi Aboriginal Corporation (KAC)	23-05-2023	Email TO relevant person	TGS emailed KAC to follow up on phone call and message left the day before. TGS said that if KAC has any input about their proposed marine seismic survey to let TGS know before 26/05/2023 so they can consider the information within the development of their environmental plan before submitting to NOPSEMA for their review. TGS also advised there is an opportunity to provide feedback during the public consultation period where the EP will be released to the wider public for review. TGS closed the email asking them to reply to the email if they had any questions or would like further detail.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Karadi Aboriginal Corporation (KAC)	6-06-2023	Email TO relevant person	TGS emailed KAC advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked KAC to advise if they have any queries about their consultation program so they can make sure KAC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where KAC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking KAC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
King Island Boat Club	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
King Island Boat Club	17-05-2022	Email FROM relevant person	Email undeliverable to one stakeholder email account.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
King Island Boat Club	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Boat Club	15-02-2023	Email TO relevant person	Forwarded email TGS sent the day before to ensure they received the email as there were IT issues where KIBC may not have been able to reply. TGS closed their email asking for all comments and replies to be provided to TGS by 16/03/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Boat Club	16-02-2023	Email FROM relevant person	Automated email advising the email TGS sent 15/02/2023 was undeliverable.	N	N/A	* (see note above table)	Continuing consultation.
King Island Landcare (Tasmania)	15-05-2023	Email TO relevant person	TGS emailed KIL seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from KIL to ensure they know about their interests or activities that may be impacted by the survey. TGS asked for KIL to provide comments and replies by 16/05/2023 but to advise if they need more time.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Landcare (Tasmania)	26-05-2023	Email TO relevant person	TGS emailed KIL to see if they had any feedback regarding their proposed marine seismic survey within the Otway Basin, including the email sent 15/05/2023. TGS advised CBIAA the were finalising their environment plan (EP) before submitting to NOPSEMA for their completion check and once NOPSEMA advise the EP is complete it will be released for public consultation and hope to incorporate any feedback KIL may have from a meeting prior to their submission. TGS continued that if they are not available for a meeting and they have information they would like TGS to consider to let them know before 02/06/2023, alternatively they can provide feedback during the public consultation period.	N	N/A	* (see note above table)	Continuing consultation.
King Island Landcare (Tasmania)	26-05-2023	Email TO relevant person	TGS emailed KIL again with a correction to their email sent earlier that day. TGS' discussed a meeting this week but it is Friday already so no time to meet. TGS advised their previous email should have read that if KIL has any information they would like TGS to consider to let them know before 02/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	13-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation
King Island Shire Council	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	19-04-2023	Email TO relevant person	TGS emailed KISC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked KISC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	19-04-2023	Email FROM relevant person	Automated reply to TGS' email sent earlier that day advising a reply within 72 hours.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
King Island Shire Council	4-05-2023	Phone call TO relevant person	SLB called KISC to fllow up on email sent 19/04/2023 regarding the proposed marine seismic survey within the Otway Basin. The council representative confirmed the factsheet had been reviewed and KISC would like to request a meeting for 09/05/2023 to discuss further. KISC asked SLB to please send a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
King Island Shire Council	8-05-2023	Email TO relevant person	TGS emailed meeting invite to KISC for 09/05/2023.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
King Island Shire Council	9-05-2023	Meeting with relevant person	TGS, SLB and SLR met with KISC to discuss their proposed marine seismic survey. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with KISC: - Other oil and gas proponents operating in the same area at the same time. - Challenging site conditions and concern any issues will impact the King Island west coast, e.g. drift waste, spill etc. - Two key industries that may be impacted include potted southern rock lobster and king crab and kelp harvesting (collected washed up on the shore). - Community consultation - propose a community meeting, KISC willing to assist with arranging. - King Island has a growing tourism industry and their pristine image is important. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
King Island Shire Council	24-05-2023	Email TO relevant person	TGS emailed KISC to provide the minutes from their meeting held on 09/05/2023 asking for KISC to advise of any amendments or redacting. TGS thanked KISC for their feedback and advised they have incorporated their comments and queries in to the environmental plan (EP). TGS continued they intend to submit to NOPSEMA soon for their completeness check of which is followed by a public consultaiton period. TGS advised they hope to hold a community information session during that period to provide the community with an overview of the project and discuss any concerns or queries the community may have. TGS advised they will incorporate any community feedback in to the EP before submitted to NOPSEMA for their environmental assessment. TGS closed the email they will be in contact regarding a community session.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	25-05-2023	Email FROM relevant person	KISC replied to TGS' email sent 24/05/2023 advising they are happy with the meeting minutes. KISC also mentioned [another proponent] had just visited King Island and held a community meeting and provided learnings from that meeting to assist TGS with their future meeting.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
King Island Shire Council	26-05-2023	Email TO relevant person	TGS replied to KISC's email received the day before, thanking KISC for their information and advising TGS will be in contact once they finalise a date for the community meeting.	N	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	31-05-2023	Email FROM relevant person	KISC replied to TGS' email sent earlier that day confirming 26/06/2023 for a community session would be best.	N	N/A	* (see note above table)	Continuing consultation.
King Island Shire Council	13-06-2023	Email TO relevant person	TGS replied to KISC's email received 31/05/2023 advising they are confirmed for 26/06/2023 for their community session at the King Island club. TGS closed email by thanking KISC for their help.	N	N/A	* (see note above table)	Continuing consultation.
King Island Tourism	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
King Island Tourism	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Tourism	19-04-2023	Email TO relevant person	TGS emailed KIT to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked KIT to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
King Island Tourism	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Kingborough Council	27-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Kingborough Council	27-04-2023	Email FROM relevant person	Automated response to TGS' email sent earlier that day advising TGS their email had been received and will be forwarded to the appropriate Council officer for actioning.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Kingborough Council	2-05-2023	Phone call TO relevant person	TGS called to follow up on email sent to KC on 27/04/2023 regarding their proposed marine seismic survey within the Otway Basin to see if they were available to meet. KC reception asked for the information to be resent to them [contact details provided] and they would get back to TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Kingborough Council	2-05-2023	Email TO relevant person	TGS emailed KC following their phone call earlier that day providing the information sheet on their proposed marine seismic survey in the Otway Basin. TGS continued as discussed, they will be in Hobart later in the week and welcome the opportunity to meet to discuss the project and hear if they have any questions or concerns. TGS closed the email by saying alternatively they could arrange an online meeting or they can call TGS direct (contact phone number provided).	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Kingborough Council	3-05-2023	Email FROM relevant person	KC replied to TGS' email sent 02/05/2023 thanking them for their email and advising it has been referred to the appropriate council officer for consideration.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Kingborough Council	4-05-2023	Email FROM relevant person	KC replied to TGS' email sent 02/05/2023 advising they have read the information and don't see it is relevant to the work they do in Kingborough managing urban waterways. KC asked to be advised if TGS think the project will have a negative impact on any waterway in Kingborough, otherwise they do not want to be further engaged in the project as they do not have the resources to spread that far from their core work.	N	N/A	* (see note above table)	Continuing consultation.
Latrobe Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Latrobe Council	16-02-2023	Email FROM relevant person	Automated reply email confiming the email had been received and allocated to the appropriate department for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	29-03-2023	Email TO relevant person	TGS emailed LPAC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided by 05/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	4-04-2023	Phone call TO relevant person	TGS called LPAC to follow up on their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer but a message provided an alternative contact number. TGS called the alternative number and spoke to a LPAC representative whom advised they hadn't received the email and provided another email address (details provided) for TGS to send to and they can print off the information and provide to them, as they had been having trouble with their server. LPAC advised they would be in contact in a couple of days.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	4-04-2023	Email TO relevant person	TGS forwarded the original email sent to LPAC on 29/03/2023 with information sheet about their proposed marine seismic survey within the Otway Basin, to an alternative email addressed obtained from LPAC earlier in the day.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	11-04-2023	Phone call TO relevant person	TGS called LPAC to follow up on their phone call and email from 04/04/2023 regarding their proposed marine seismic survey within the Otway Basin. LPAC confirmed they received the information emailed on 04/04/2023 and would like a meeting but will not be online as not everyone is online so will need to be in person. LPAC closed the call advising they would let TGS know the meeting date and time but proposing next week.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	17-04-2023	Phone call TO relevant person	TGS called LPAC to follow up on their phone call on 11/04/2023. LPAC advised they have not been able to organise a meeting due to illness. LPAC advised to call back next week when they should have been able to organise a meeting time by then.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	24-04-2023	Phone call TO relevant person	TGS called LPAC to follow up on previous phone call on 17/04/2023 as suggested by LPAC. TGS advised they would be visiting Tasmania next week and asked if they would be available to meet. LPAC suggested a meeting on 05/05/2023 at 7 pm would work for them at TGS' hotel as LPAC didn't have any internet access. TGS said they would confirm a location with LPAC before their meeting on 05/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	27-04-2023	Message TO relevant person	TGS text messaged LPAC to confirm a meeting with them on 05/05/2023 at 7:00 pm at [location] in Hobart.	N	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	27-04-2023	Message FROM relevant person	LPAC replied to TGS' text message sent earlier that day confirming meeting date, time and venue and advised they'd let everyone know.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	2-05-2023	Message conversation with relevant person	LPAC text messaged TGS advising they have two peopl for the online meeting so far. TGS asked LPAC if they will come in person with others dialing in to meeting. LPAC answered yes and have three so far.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Lia Pootah Aboriginal Corporation	3-05-2023	Email TO relevant person	TGS emailed an online meeting invite to another LPAC representative to attend the evening of 05/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	3-05-2023	Message conversation with relevant person	TGS text messaged an online meeting invitation to another LPAC representative to attend the evening of 05/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Lia Pootah Aboriginal Corporation	5-05-2023	Meeting with relevant person	TGS, SLR and SLB met with LPAC to provide information about the proposed survey, to identify any potential impacts to LPAC's functions, interests or activities and discuss any queries LPAC has with the proposed survey. The meeting's key comments and queries included: - Particular concern around impacts to fish, southern right whales (existing cultural link), plankton, krill, - Environmental plan development - process, purpose etc. - Control measures TGS proposes to protect marine species from harm. - Underwater sound modelling. - Fuel oil spill modelling to identify EMBA. - Various levels of other acoustic emissions, e.g. vocalising whales, commercial shipping etc. - Future use of data by oil and gas companies. - Fuel oil spill response. - Seismic survey use for archaeological information. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Impacts to sensitive ecological receptors (fish, southern right whales, plankton, krill): **Section 7.1.2** (physical presence of the seismic vessel and equipment), **Section 7.2.2** (acoustic disturbance), **Section 7.3.2** (permissible waste discharges), **Section 7.5.2** (artificial light emissions), **Section 8.1.2** (IMS), **Section 8.3.3 & 8.4.2** (hydrocarbon spill), **Section 8.5.2** (accidental release of hazardous/non-hazardous materials). Environmental plan development process: **Section 2** (environmental management framework), **Section 6** (impact assessment and risk assessment methodology) Control measures: **Section 7.1.5** (physical presence of the seismic vessel and equipment), **Section 7.2.5** (acoustic disturbance), **Section 7.3.4** (permissible waste discharge), **Section 7.4.4** (atmospheric emissions), **Section 7.5.4** (artificial light), **Section 8.1.5** (IMS), **Section 8.2.5** (streamer loss), **Section 8.3.4 & 8.4.4** (hydrocarbon spill), **Section 8.5.4** (accidental release of hazardous/non-hazardous materials). Underwater noise modelling / acoustic disturbance: **Section 7.2** and subsections therein Fuel oil spill modelling: **Section 8.3.2** (oil spill trajectory modelling) Fuel oil spill response: **Section 10.10** (Oil Pollution Emergency Plan) Remaining concerns will be subject to ongoing consultation. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects. Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP.	Continuing consultation.
Lia Pootah Aboriginal Corporation	16-05-2023	Email TO relevant person	TGS emailed LPAC to provide minutes and a copy of the presentation from meeting held 05/05/2023. TGS also provided a copy of the underwater acoustic modelling report and literature references as discussed during the meeting. TGS also included a link to a research project for the impacts of seismic surveying on the coral reef environment. TGS thanked LPAC for meeting with them and advised they will keep them updated as things progress, otherwise asked them to get in contact if they have any amendments or queries.	Y - Meeting minutes, copy of presentation and literature reference, underwater acoustic modelling report, publication references	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	16-05-2023	Email FROM relevant person	Automated email advising TGS email sent earlier that day to one of the recipients was underliverable.	N	N/A	* (see note above table)	Continuing consultation.
Lia Pootah Aboriginal Corporation	25-05-2023	Letter TO relevant person	TGS posted a registered letter to LPAC providing information emailed to them on 16/05/2023 including minutes, copy of presentation and information discussed during a meeting held with LPAC on 05/05/2023.	Y - Meeting minutes, copy of presentation and literature reference, underwater acoustic modelling report, publication references	N/A	* (see note above table)	Continuing consultation.
Marine and Safety Tasmania (MAST)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Marine and Safety Tasmania (MAST)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Marine and Safety Tasmania (MAST)	19-04-2023	Email TO relevant person	TGS emailed MAST to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked MAST to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Marine and Safety Tasmania (MAST)	1-05-2023	Email FROM relevant person	MAST replied to TGS' email sent 19/04/2023 thanking TGS for contaciting MAST in relation to their seismic survey within the Otway Basin and apologised for the slow response. MAST advised that as the drilling occurs within the Commonwealth waters, then MAST has no direct involvement in activities occurring within this area. MAST continued that TGS' correspondence indicates the Hydrographic Office will release Notice to Mariners, however MAST would like to also be kept in form of the more general nature of when activities will be taking place then they can issue a local Tasmanian Notice to Mariners relating to the activity, which may assist inform recreational and fishing vessels in the area of activities taking place.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Marine and Safety Tasmania (MAST)	8-05-2023	Email TO relevant person	TGS' replied to MAST's email received 08/05/2023 thanking them for their response. TGS clarified they are proposing to carry out a marine seismic survey not drilling (as referred to in their previous email). TGS advised they have noted their comment and appreciate their assistance with issuing a local Tasmanian Notice to Mariners to inform recreational and fishing vessels in the area of the activity. TGS also confirmed they would keep MAST on their consultation list to keep them updated.	N	N/A	* (see note above table)	Continuing consultation.
Marine Conservation Program	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Marine Mammal Foundation	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Marine Mammal Foundation	19-04-2023	Email TO relevant person	TGS emailed MMF to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked MMF to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Marine Mammal Foundation	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
MD Australian Oceanographic Services Pty Ltd	12-08-2022	Email FROM relevant person	The stakeholder expressed an interest in providing Fisheries Liaison Services for the planned Otway Basin Survey, and went on to detail relevant credentials.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
MD Australian Oceanographic Services Pty Ltd	18-08-2022	Email TO relevant person	TGS/Schlumberger explained that they are engaging with the fishing industry via various fishing industry associations, and the process is not yet advanced enough as to be planning specific surveys. TGS/Schlumberger requested the stakeholder send though further information on projects where they have provided fisheries liaison and MFO services.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
MD Australian Oceanographic Services Pty Ltd	23-08-2022	Email FROM relevant person	The stakeholder attached their CV to provide further information on past experience as requested by TGS/Schlumberger.	Y - Stakeholder CV	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
melythina tiakana warrana Aboriginal Corporation	4-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS explained they are identifying potential relevant persons by those that may be impacted by their worst case scenario for their unplanned activities (release of fuel from a collision). TGS asked MTWAC to advise if they'd like to discuss further or would like further or more information, providing an offer to arrange an online meeting, or alternatively to let them know if the survey is not of interest or relevant to them and they will remove them from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
melythina tiakana warrana Aboriginal Corporation	11-05-2023	Phone call TO relevant person	TGS called MTWAC to follow up email sent 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising they were following up on their email sent 04/05/2023 and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
melythina tiakana warrana Aboriginal Corporation	15-05-2023	Phone call TO relevant person	TGS called MTWAC to follow up emails sent 04/05/2023 and phone call and message left 11/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising purpose of their call and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
melythina tiakana warrana Aboriginal Corporation	22-05-2023	Phone call TO relevant person	TGS called MTWAC to follow up email sent 04/05/2023 regarding their proposed marine seismic survey within the Otway Basin and there was no answer. TGS left a message advising they were following up on their email sent 04/05/2023 and asked them to call TGS back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
melythina tiakana warrana Aboriginal Corporation	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
melythina tiakana warrana Aboriginal Corporation	25-05-2023	Email TO relevant person	TGS replied to MTWAC's email received earlier that day thanking them for their email. TGS closed their email asking MTWAC to let TGS know if they want to set up a call or meeting online and they can arrange that.	N	N/A	* (see note above table)	Continuing consultation.
melythina tiakana warrana Aboriginal Corporation	25-05-2023	Email FROM relevant person	MTWAC replied to TGS' email sent 22/05/2023 advising they'd forwarded the information to the relevant people but had not received any comments. MTWAC advised their organisation is focused on the NE of Tasmania as their priority, however they would ask the others once more if any comments. MTWAC asked if the timeline for comments could be extended as they are fully voluntary and their board members are either working or have significant commitments. MTWAC apologised for nor returning TGS' calls.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
melythina tiakana warrana Aboriginal Corporation	6-06-2023	Email TO relevant person	TGS emailed MTWAC advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked MTWAC to advise if they have any queries about their consultation program so they can make sure MTWAC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where MTWAC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking MTWAC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	12-04-2023	Email TO relevant person	TGS emailed MLALC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback by 19/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	20-04-2023	Phone call TO relevant person	TGS called MLALC to follow up email sent to MLALC on 12/04/2023. TGS spoke to the receptionist who advised everyone was at a meeting but to call back after 2 pm and speak to the acting CEO (name provided). TGS called back at 2:30 pm but the receptionist advised the acting CEO would call back and took contact details.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Merrimans Local Aboriginal Land Council	21-04-2023	Email TO relevant person	TGS emailed MLALC to follow up on the email sent 12/04/2023 and message left with MLALC receptionist on 20/04/2023. TGS said they would really like to get some time online with MLALC to discuss their proposed marine seismic survey and hear if MLALC has any concerns. TGS advised they could arrange an online meeting at MLALC's convenience to discuss or TGS offered their mobile contact details for a phone call. TGS closed the email thanking MLALC.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	3-05-2023	Email TO relevant person	TGS emailed online meeting invite to MLALC for 09/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	3-05-2023	Email TO relevant person	TGS emailed MLALC to ask if possible to change previously scheduled meeting to either 10 or 11/05/2023 as one of their team is not available.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	8-05-2023	Email TO relevant person	TGS emailed MLALC advising they look forward to meeting with them tomorrow.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	8-05-2023	Email TO relevant person	TGS replied to MLALC's email received earlier that day confirming their meeting tomorrow was at 11:00 am.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	8-05-2023	Email FROM relevant person	MLALC replied to TGS' email sent earlier that day asking what time the meeting was tomorrow.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Merrimans Local Aboriginal Land Council	8-05-2023	Email FROM relevant person	MLALC replied to TGS' email sent earlier that day thanking TGS for confirming the meeting time.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Merrimans Local Aboriginal Land Council	9-05-2023	Meeting with relevant person	TGS, SLB and SLR met with MLALC to discuss their proposed marine seismic survey. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with MLALC: - Discussed the EMBA triggering consultation with MLALC but low likelihood of fuel release occurring, guides consultation. - Best way to consult would be to go out to the people. - Need to speak to the people that know the water. - Important to discuss with MLALC board - TGS to arrange a meeting with the Board 17/05/2023. MLALC provided contact details for several other groups that may be interested in project. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Merrimans Local Aboriginal Land Council	9-05-2023	Email TO relevant person	TGS emailed MLALC a meeting invite for 17/05/2023 to meet with the MLALC Board.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	17-05-2023	Email TO relevant person	TGS emailed MLALC to remind them of the meeting scheduled for today to discuss their proposed marine seismic survey with the MLALC Board.	N	N/A	* (see note above table)	Continuing consultation.
Merrimans Local Aboriginal Land Council	17-05-2023	Meeting with relevant person	TGS, SLB and SLR arranged a meeting with MLALC Board but no one from MLALC arrived so the meeting was cancelled.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Merrimans Local Aboriginal Land Council	24-05-2023	Email TO relevant person	TGS emailed MLALC to provide minutes and copy of presentation from meeting held 09/05/2023. TGS asked MLALC to advise if any amendments of text needs removing. TGS said they appreciate their time and information they shared with TGS asked if there was another opportunity to meet with their Board over the next week. TGS advised they are finalising their EP before submitting to NOPSEMA mid-June, following that their EP will be released for public consultaiton. TGS commented would be good to incorporate any feedback from the wider MLALC group may have from a meeting prior to submitting their EP, however if they are not available but still have information they would like TGS to consider to please let TGS know before 31/05/2023. Alternatively MLALC can provide feedback during the public consultation period.	Y - Meeting minutes and copy of presentation	N/A	* (see note above table)	Continuing consultation.
Mineral Resources Tasmania (MRT), Department of State Growth	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Mineral Resources Tasmania (MRT), Department of State Growth	14-02-2023	Email FROM relevant person	MRT advised they do not presently have any functions or activities in the area that may be affected but would like to receive 48 hour look ahead plans. MRT also advised appears to be an error with the TGS email account.	N	Stakeholder has provided information and/or requested additional information. Would like 48 hour lookahead plans sent to them. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Mineral Resources Tasmania (MRT), Department of State Growth	14-02-2023	Email TO relevant person	Reply to MRT thanking them for their response and advising a note has been made to ensure they receive 48 hours look ahead plans once survey underway and acknowledging them for informing TGS of email account error.	N	N/A	* (see note above table)	Continuing consultation.
Mineral Resources Tasmania (MRT), Department of State Growth	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Mornington Peninsula Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Mornington Peninsula Shire Council	16-02-2023	Email FROM relevant person	Automated reply email acknowledging email and advising email will be forwarded to relevant department for response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Mornington Peninsula Shire Council	3-05-2023	Email TO relevant person	TGS emailed MPSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked MPSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Mornington Peninsula Shire Council	3-05-2023	Email FROM relevant person	Automated reply email acknowledging email and advising email will be forwarded to relevant department for response.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Mornington Peninsula Shire Council	8-05-2023	Email TO relevant person	TGS replied to MPSC's email received earlier that day thanking them for their reply. TGS advised they have noted their comments and confirmed MPSC will remain on the project's consultation list.	N	N/A	* (see note above table)	Continuing consultation.
Mornington Peninsula Shire Council	8-05-2023	Email FROM relevant person	MPSC replied to TGS' email sent 03/05/2023 following up on their proposed marine seismic survey. MPSC thanked TGS for reaching out and the updated information sheet which has been added to their records. MPSC said they have reviewed the information sheet and don't consider a formal submission necessary given the proposed location of the survey within the Otway Basin and considerable distance from their municipality. MPSC closed their email advising they still appreciate being kept in the loop on the project and to not remove them from the consultation list.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-04-2023	Email TO relevant person	TGS emailed MSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked MSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-04-2023	Email TO relevant person	TGS replied to MSC's email received earlier that day with meeting date and time suggestions confirming Friday 28/04/2023 at 2 pm would suit and advised they would send a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-04-2023	Email TO relevant person	TGS emailed an online meeting invite to MSC for 28/04/2023 at 2:00 pm.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-04-2023	Email FROM relevant person	Automated reply from MSC thanking TGS for contacting MSC and advising the email sent earlier that day has been referred to the appropriate officer for action.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Moyne Shire Council	24-04-2023	Email FROM relevant person	MSC replied to TGS' email sent earlier that day apologising for not getting back sooner. MSC asked to set up an online meeting either 27/04/2023 at 10:00 or 28/04/2023 at 10:00 am or 2:00 pm.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	28-04-2023	Meeting with relevant person	TGS, SLB and SLR met with MSC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries and concerns with MSC: - Other activities occurring within their area planned for the same time. - Whale feeding and migration. - Impacts of acoustic disturbance on fish. - NOPSEMA expertise for assessing the environment plan (EP). - Monitoring carried out during the surveying. - Current status of EP and release for public review. - Community engagement > expect community meetings. TGS asked if they could suggest other groups they should be consulting with and MSC advised they can assist with this. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Effects to marine mammals: Sections 7.2.2.3.6 and 7.2.2.4.2 (Acoustic imapcts to marine mammals with control measures specific for marine mammals listed in Table 84),and Section 8.3.3.2.5 (effects of a hydrocarbon spill to marine mammals). Effects of acoustic disturbance on fish: Section 7.2 and subsections therein (**Section 7.2.2.1** (Noise effect criteria, and **Section 7.2.2.3.2** effects of acoustic deisturbance to bony fish). Monitoring carried out during the surveying: **Section 10.6** (reporting requirements, including **Section 10.6.3** Reportable and Recordable Incident Reporting). Other activities occurring within the same area: **Section 9** (Cumualtive Effects). NOPSEMA processes: **Section 2** (Legislative Framework, including **Section 2.3** Relevant NOPSEMA Guidance Documents). Consultation and community engagement: Section 5 (Relevant Persons Consultation). Ongoing consultation with MSC will be undertaken in accordance with the methods set out in Section 5 to ensure MSC have had both sufficient information, and sufficient time to engage in the consultation programme.	Continuing consultation.
Moyne Shire Council	9-05-2023	Email FROM relevant person	MSC emailed TGS following up on meeting 28/04/2023 where there was a suggestion for TGS to provide MSC with a list of relevant persons they were intending on consulting with in the Moyne to allow MSC to identify any others for TGS. MSC also commented that TGS would consider holding online or in-person information sessions. MSC offered to chat by phone.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	10-05-2023	Email TO relevant person	TGS replied to MSC's emailed received 09/05/2023 confirming would be good to chat and to let TGS know when they are available.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	12-05-2023	Email TO relevant person	TGS replied to MSC's email received earlier that day thanking them for their phone conversation earlier and will update MSC with their plans for meetings next week.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	12-05-2023	Email FROM relevant person	MSC emailed TGS providing an article for TGS records printed in the Warrnambool Standard regarding marine seismic surveys.	Y - Newspaper article	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	16-05-2023	Email TO relevant person	TGS emailed MSC the minutes to their meeting held on 28/04/2023 for their review and record.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	17-05-2023	Email FROM relevant person	MSC replied to TGS' email sent the day before thanking TGS and advised of another company holding community information sessions. MSC asked TGS whether TGS was planning to carry out community information sharing.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	17-05-2023	Email FROM relevant person	MSC emailed TGS advising their councillors have requested briefings from companies involved in the seismic programs currently being proposed for the Otway Basin and therefore invited TGS to attend a session (in-person or online) on 20/06/2023 to provide information to councillors, the Executive Management Team and Energy Projects Team regarding their Otway Basin marine seismic survey. MSC advised they will let TGS know of the time once it has been confirmed and will email a placeholder invite. MSC closed the email advising they will call Friday to discuss.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	17-05-2023	Email FROM relevant person	MSC emailed a placeholder invite to TGS for councillor meeting on 20/06/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	17-05-2023	Email FROM relevant person	MSC emailed TGS providing information to assist with arranging a community session planned for Port Fairy.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	18-05-2023	Email TO relevant person	TGS replied to MSC's email from the day before in regards to planning a community session at Port Fairy.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	18-05-2023	Email TO relevant person	TGS replied to MSC's email received earlier that day confirming the details of the Port Fairy community session for 6-7 pm on 29/05/2023 at (location provided). TGS provided a copy of the advertisement scheduled for the local newspaper confirming all of the session details.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	18-05-2023	Email FROM relevant person	MSC replied to TGS' email sent earlier that day regarding arrangements for community session at Port Fairy.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	22-05-2023	Email TO relevant person	TGS emailed MSC asking if MSC would be available to discuss the session with the councillors scheduled for later in the month with them and asked if MSC was available 30/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-05-2023	Email TO relevant person	TGS replied to MSC's email received earlier that day regarding a meeting on 29/05/2023 suggesting a venue.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	24-05-2023	Email FROM relevant person	MSC replied to TGS' email sent 22/05/2023 about a possible meeting on 30/05/2023 and advised they were not available but could meet before the community session in Port Fairy on 29/05/2023.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	24-05-2023	Email FROM relevant person	MSC emailed TGS to confirm they can meet on 29/05/2023 (location and time provided) and advised they will send TGS a meeting invite.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	24-05-2023	Email FROM relevant person	MSC emailed an online meeting invitation for 29/05/2023 (general catch-up).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	30-05-2023	Email FROM relevant person	MSC emailed an online meeting invitation for 20/06/2023 (councillor briefing).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Moyne Shire Council	30-05-2023	Email FROM relevant person	MSC emailed TGS following meeting on 29/05/2023 to provide TGS with a link to MSC's energy project web pages.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	2-06-2023	Email FROM relevant person	MSC emailed TGS to advise that all presenters at the 20/06/2023 Council briefing provide a copy of their presentation by 13/06/2023 and to confirm presenters by middle of next week.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	2-06-2023	Email TO relevant person	TGS acknowledged MSC's email received earlier that day.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	6-06-2023	Email TO relevant person	TGS acknowledged MSC's email received on 30/05/2023 providing information following their meeting on 29/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	8-06-2023	Email FROM relevant person	MSC emailed TGS to confirm who from TGS will be presenting at the Council briefing on 20/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	8-06-2023	Email TO relevant person	TGS replied to MSC's email received earlier that day confirming who from TGS will be presenting at the Councillor's briefing and advised they will provide their presentation to them 13/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	8-06-2023	Email TO relevant person	TGS emailed MSC providing minutes from their meeting on 29/05/2023 at Port Fairy for their record and review. TGS asked MSC to advise of any changes.	Y - Meeting minutes from 29/05/2023 meeting.	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	8-06-2023	Email FROM relevant person	MSC replied to TGS' email sent earlier that day advising of changes to the 29/05/2023 meeting minutes and requested a copy of the updated version for their records.	Y - Amended meeting minutes	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	8-06-2023	Email TO relevant person	TGS provided MSC with the amended meeting minutes from meeting in Port Fairy on 29/05/2023.	Y - Amended meeting minutes	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	13-06-2023	Email TO relevant person	TGS provided MSC with a copy of the presentation prepared for their meeting with MSC councillors 20/06/2023. TGS asked MSC to advise if they need to include or remove any information.	Y - Prepared presentation (project overview)	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	14-06-2023	Email FROM relevant person	MSC replied to TGS' email sent the day before advising TGS to leave the slides regarding seismic surveying in the presentation. MSC advised another proponent is presenting on the same day but they will be discussing exploration drilling.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	14-06-2023	Email TO relevant person	MSC emailed TGS a meeting invited for 20/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	16-06-2023	Email FROM relevant person	MSC emailed TGS to advise MSC has discussed the updated meeting notes from their meeting 29/05/2023 and requested the detailed minutes be kept confidential.	N	N/A	* (see note above table)	Continuing consultation.
Moyne Shire Council	16-06-2023	Email TO relevant person	TGS replied to MSC's email receive earlier that day advising they have noted and actioned their request from that email.	N	N/A	* (see note above table)	Continuing consultation.
National Native Title Tribunal	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
National Native Title Tribunal	06-10-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures TGS/Schlumberger explained that from published online resources that Native Title Consent Determination Areas are registered for the following Traditional Owner Groups: • Ngarrindjeri and Others (South Australia); • First Nations of the South East (South Australia); • Gunditjmara and Eastern Maar (Victoria); and • Eastern Maar (Victoria). TGS/Schlumberger asked the stakeholder to confirm if any Determinations or groups exist for Tasmania or King Island. They also asked the stakeholder to give advice as to whether the relevant Sea Country Groups are the same as the Native Title groups.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
National Native Title Tribunal	6-10-2022	Email TO relevant person	TGS thanks NNTT for their email input dated 6 Oct 2023.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
National Native Title Tribunal	06-10-2022	Email FROM relevant person	The stakeholder explained that the existence or otherwise of native title is quite separate to matters relating to Aboriginal cultural heritage or the identifying of traditional owner groups for areas not under a current native title determination or application. The stakeholder also gave contact details for relevant Native Title Representative Bodies.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
National Native Title Tribunal	6-10-2022	Email FROM relevant person	Automatic email informing that correspondence will be forwarded to the appropriate team.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
National Native Title Tribunal	6-10-2022	Email FROM relevant person	Reply to TGS email dated 6-Oct-2022. Advice regarding contacting relevant Native Title Representative Bodies.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
National Offshore Petroleum Titles Administrator	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
National Offshore Petroleum Titles Administrator	16-02-2023	Email FROM relevant person	Automated reply acknowledging email has been received.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
National Parks and Wildlife Services South Australia (Marine Parks)	30-05-2023	Online enquiry form submitted	TGS submitted an online enquiry regarding their proposed marine seismic survey within the Otway Basin advising they are seeking to engage with NPWSSA as a potentially relevant person. TGS advised they would like to know whether they have any interests or activities that may be affected by the proposed survey. TGS advised they are finalising their EP before submitting to NOPSEMA for their completion check and would be great to include any feedback NPWSSA has. TGS also advised they have a factsheet with more informtion and if they provide contact details they will send to them, alternatively they can call TGS to discuss any queries or arrange an online meeting to discuss further.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
New South Wales Aboriginal Land Council	29-03-2023	Email TO relevant person	TGS emailed NSWALC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS asked if NSWALC could advise the name of groups TGS may need to speak to in the lower NSW area to refine the list of who they contact, closing the email by advising any information would be very much appreciated.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
New South Wales Aboriginal Land Council	4-04-2023	Phone call TO relevant person	TGS called NSWALC to follow up on email sent 29/03/2023 with information about their proposed marine seismic survey within the Otway Basin and spoke to a NSWALC representative whom advised they would look at the email and forward to the appropriate person and get back to TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
New South Wales Aboriginal Land Council	11-04-2023	Email FROM relevant person	NSWALC emailed TGS providing the names, contact details and location of the various land councils within NSW.	Y - Location map and link to contact details	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
New South Wales Aboriginal Land Council	11-04-2023	Phone call TO relevant person	TGS called NSWALC to follow up on phone call from 04/04/2023. NSWALC found the email and said they would send a map and link to the different land councils and TGS had any trouble contacting them, they can help out with contacts.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
New South Wales Aboriginal Land Council	11-04-2023	Email TO relevant person	TGS replied to NSWALC's email received earlier that day thanking them for their email and information.	N	N/A	* (see note above table)	Continuing consultation.
New South Wales Aboriginal Land Council	12-04-2023	Email TO relevant person	TGS emailed NSWALC again thanking them for their past assistance with identifying land councils within lower coastal NSW. TGS advised they identified the key relevant land councils and most of the contact details except: - Bodalla Local Aboriginal Land Council; and - Wagonga Local Aboriginal Land Council. TGS asked NSWALC if they had contact details either of these land councils.	N	N/A	* (see note above table)	Continuing consultation.
New South Wales Aboriginal Land Council	20-04-2023	Email TO relevant person	TGS emailed NSWALC to follow up on email sent 12/04/2023 regarding contact details for two traditional owner groups within NSW. TGS also asked for contact details for a third traditional owner group, as phone number was not in service.	N	N/A	* (see note above table)	Continuing consultation.
New South Wales Aboriginal Land Council	27-04-2023	Phone call TO relevant person	TGS called NSWALC to follow up on email sent 20/04/2023 requesting contact details for Wagonga and Bodalla aboriginal land councils however there was no answer. TGS left a message for NSWALC to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
New South Wales Aboriginal Land Council	1-05-2023	Phone call TO relevant person	TGS called NSWALC to follow up on previous emails and phone calls regarding their proposed marine seismic survey within the Otway Basin and obtaining contact details for Wagonga and Bodalla Aboriginal Land Councils. TGS left a message to return their call.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
New South Wales National Parks	9-05-2023	Email TO relevant person	TGS emailed NSWNP seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from NSWNP to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked NSWNP to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
New South Wales National Parks	29-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 02/06/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	14-03-2023	Phone call TO relevant person	TGS called NREC to follow up email sent to NREC on 16/02/2023 regarding the proposed Otway 3D Seismic Survey and was provided this NREC representative's name and email address as the best person to contact regarding the survey.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	14-03-2023	Email TO relevant person	TGS emailed the NREC representative contact details provided by the NREC receptionist obtained from a phone call earlier in the day. TGS attached the factsheet and advised this had been emailed last month to the admin email address and they plan to send out a shorter version in the coming days. TGS explained they hoped the factsheet would prompt discussions with them regarding any concerns they may have regarding the proposed survey. TGS asked if NREC could let them know if they have time to discuss (phone call or online meeting) to present the survey to them and concluded the email by stating they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	22-03-2023	Email TO relevant person	TGS emailed NREC to provide them with an updated version of the factsheet which is more concise and provides an explanation of why TGS is wanting to consult with NREC on their planned project. TGS continued the factsheet explains what a marine survey is, what are the potential effects on the environment, the measures TGS has in place to limit the potential effects and safeguards in place should an unexpected event occur. TGS said they would like to meet NREC online to share TGS's plans and whether NREC has any concerns and can arrange an online meeting at their convenience to discuss. TGS closed the email by thanking NREC and advising they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	27-03-2023	Phone call TO relevant person	TGS called to follow up on email sent to NREC on 22/03/2023. The NREC representative advised the original contact that was provided to TGS was not the correct person and provided an alternative contact.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	27-03-2023	Email TO relevant person	TGS emailed NREC to provide information (including factsheet) about their marine seismic survey proposed for Otway Basin. TGS advised the NREC contact they had been provided their contact details from a phone call earlier that day to the NREC office. TGS advised they would really like to get some time online with them to hear about their plans and more importantly they would like to hear if they have any concerns. TGS advised they could arrange an online meeting at their convenience to discuss. TGS closed the email by thanking NREC and advising they look forward to hearing back from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	11-04-2023	Email TO relevant person	TGS emailed NREC to follow up email sent 27/03/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS advised they would like to meet NREC online to discuss the proposed survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss, or they can call them direct (mobile contact details provided). TGS closed the email by thanking NREC.	N	N/A	* (see note above table)	Continuing consultation.
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	17-04-2023	Phone call TO relevant person	TGS called NREC to follow up on previous correspondence but there was no answer.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	26-04-2023	Phone call TO relevant person	TGS called NREC to follow up on previous correspondence and the receptionist advised the person TGS had been trying to contact was not available. The receptionist confirmed this person was the best person to speak to and they would try find a phone number to contact them direct as they didn't have one. The receptionist also suggested they contact another person within NREC (contact details provided).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Ngarrindjeri Aboriginal Corporation RNTBC Ngarrindjeri Ruwe Empowered Communities (NREC)	26-04-2023	Email TO relevant person	TGS emailed an alternative contact within NREC which the NREC receptionist suggested during a phone call TGS made to NREC earlier that day. TGS advised they were following up on an email TGS sent a couple of weeks ago regarding their proposed Otway 3D seismic survey. TGS advised they had spoken to the NREC receptionist who provided the alternative contact and had attached the information sheet detailing information about the survey. TGS said they would really like to meet NREC online to discuss the proposed survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
NTS Corp	25-05-2023	Email TO relevant person	TGS emailed NTSCORP seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from NTSCORP to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked NTSCORP to reply before 02/06/2023 and advise if they would like to discuss further or would like more information.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
NTS Corp	6-06-2023	Phone call TO relevant person	TGS called NTSC to follow up on email TGS sent 25/05/2023 regarding their proposed marine seismic survey and the person they needed to speak to was not available and they were having trouble with the email. TGS said they would resend the email.	N	N/A	* (see note above table)	Continuing consultation.
NTS Corp	6-06-2023	Email TO relevant person	TGS emailed NTSC following phone call made earlier that day forwarding original email TGS sent on 25/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS explained they contacted NTSC based on a recommendation from another relevant person. TGS closed their email thanking NTSC for their help.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
NTS Corp	13-06-2023	Phone call TO relevant person	TGS called NTSC to follow up on email TGS sent 06/06/2023 regarding their proposed marine seismic survey. NTSC asked TGS to forward email again to a different address and they would pass on to the appropriate person. TGS confirmed they would forward the email to the new NTSC address.	N	N/A	* (see note above table)	Continuing consultation.
NTS Corp	13-06-2023	Email TO relevant person	TGS emailed NTSC following phone call made earlier that day regarding their proposed marine seismic survey. TGS included previous correspondence TGS sent to NTSC within email and provided information sheet. TGS closed the email asking NTSC to let TGS know if they would like additional information or a meeting to discuss further (contact details provided).	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
NTS Corp	14-06-2023	Email FROM relevant person	NTSC replied to TGS' email sent the day before thanking TGS for following up on the information. NTSC advised they have referred the information to their South Coast native title applicant to consider. NTSC asked TGS to allow traditional owners 14 days to consider the potential impacts to their country and decide whether comment is necessary (comment provided by 28/06/2023).	N	N/A	* (see note above table)	Continuing consultation.
NTS Corp	15-06-2023	Email TO relevant person	TGS replied to NTSC's email received the day before. TGS confirmed they can allow 14 days for traditional owners to consider the potential impactrs of their proposed survey on their country and decide whether a comment is necessary. TGS attached a copy of a brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked NTSC to advise if they have any queries about their consultation program so they can make sure NTSC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where NTSC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking NTSC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	24-04-2023	Email TO relevant person	TGS emailed ORCV to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked ORCV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	27-04-2023	Email FROM relevant person	ORCV replied to TGS' email sent 24/04/2023 seeking feedback. ORCV advised they run yacht races which may include areas withn the EP zones namely between the Christmas and New Year period (Melbourne to Hobart race) and the Melbourne to Port Fairy race during the Easter period of 2024. ORCV advised they will ensure the EP area is designated as an exclusion zone for any yachts and request TGS provide the location of all th EP boundary corners to allow us to establish this exclusion zone.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	3-05-2023	Email TO relevant person	TGS replied to ORCV's email received 27/04/2023 thank them for their email and attached the EP location co-ordinates and shapefiles. TGS asked ORCV to let them know fi the area will affect their races and they can meet and discuss if there is potentially another option other than exclusion zone for their race.	Y - EP location shapefiles and coordinates	N/A	* (see note above table)	Continuing consultation.
Ocean Racing Club of Victoria (ORCV)	3-05-2023	Email FROM relevant person	ORCV replied to TGS' email sent earlier that day thanking TGS and advising ORCV will contact them if they have any further queries.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	17-08-2022	Email FROM relevant person	The stakeholder reached out to request a meeting with TGS/Schlumberger to provide feedback on the proposal at the earliest convenience.	Y - Consultation request	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	24-08-2022	Email FROM relevant person	Relevant person provides letter requesting more information regarding the application.	Y - Consultation letter	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	04-09-2022	Email FROM relevant person	The stakeholder reached out to follow up on their request for a meeting with TGS/Schlumberger to provide feedback on the proposal at the earliest convenience.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	15-02-2023	Email TO relevant person	TGS reconnected to advise of changes to survey (area size and contact details) and provide updated information sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	16-02-2023	Email FROM relevant person	OCEAN advised they requested consultation with SLB/TGS regarding initial proposed for larger survey and didn't receive a response. OCEAN referred to the amended NOPSEMA consultation guidelines and requested consultation with TGS if the reduced survey is to be undertaken solely by TGS and not SLB. OCEAN also advised they recently undertook consultation with [another proponent] which is also proposing a survey in the Otway Basin and asked for advice on a date when the meeting might occur.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	20-02-2023	Email TO relevant person	Acknowledged email provided for email to TGS 16/02/2023 advising TGS would like to meet with OCEAN to discuss survey. TGS asked if OCEAN could provide a list of the main items of concern they would like to discuss during the meeting. TGS also asked if there was a good understanding in OCEAN of 3D seismic surveys, modelling requirements and control measures and offered to provide a brief overview. TGS asked if there was a suitable time to meet over the next 2-4 weeks and asked if they would be inviting other groups to the meeting or just OCEAN members.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	27-02-2023	Email TO relevant person	TGS emailed OCEAN following up on email sent to OCEAN on 20/02/2023 and offered to let TGS know when convenient to visit over the next 1-3 weeks to allow travel to be arranged.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	27-02-2023	Email TO relevant person	TGS emailed OCEAN to ask if they can provide later dates for a meeting so they can consider travel plans. TGS also asked if OCEAN can provide a list of their main concerns they would like to discuss at the meeting so TGS can come fully prepared. TGS also asked: - if there would be Powerpoint facilities as may be beneficial to present some slides to help with discussions; - will OCEAN invite other groups to the meeting or just OCEAN members; and - is there a good understanding of what is involved with undertaking a seismic survey, modelling requirements as part of the EP development and control measures implemented etc within their group. TGS offered to provide an overview of all of this to help with their understanding and knowledge, as well as regulatory requirements.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	27-02-2023	Email FROM relevant person	OCEAN replied to TGS' email from 27/02/2023 acknowledging their request to meet. OCEAN suggested either Mon 6 or Tues 7 March and would be an early evening meeting (~5:30 pm).	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	28-02-2023	Email FROM relevant person	OCEAN acknowledged TGS' previous email sent 27/02/2023. OCEAN noted that TGS stated any time over the next three weeks and any weekday except a Friday would suite them. OCEAN confirmed they do have Powerpoint presentation facilities but asked this be no longer than 10 minutes. OCEAN advised their group is well informed on seismic surveys and how they are done, so there's no need to cover that. They are keen for detail on the current proposal only, e.g. who will be undertaking it now and whether SLB is still involved, why the area has been downsized, whether there will be an overlap with the seismic surveys proposed by other companies in Otway Basin and what assurances can be given that any limitations placed on the proposal by NOPSEMA will be met (if approved). OCEAN said they would then like 10 minutes to present their concerns and why they care about the propose before questions from the members. OCEAN concluded they will invite Apollo Bay Fisherman's Cooperative to attend but their presence will depend on the meeting date and their availability.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	3-03-2023	Email TO relevant person	TGS replied to OCEAN's email 03/03/2023 enquiring if there was an update regarding meeting. TGS advised they would like to host an online meeting with OCEAN where TGS can share details about the proposed either later next week or the following week. TGS said if OCEAN choose a date and time that is most convenient and which online platform (Zoom or Teams), TGS will set up the meeting.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	3-03-2023	Email FROM relevant person	OCEAN emailed TGS asking if there was an update on previous email regarding arranging a meeting.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	9-03-2023	Email TO relevant person	TGS advised OCEAN they had sent an email to OCEAN on 03/03/2023 responding to their previous email. TGS advised they would like to host an online meeting with OCEAN to share information about the project either later in the week or the following week and asked OCEAN to choose a convenient day and time and advise which meeting platform they would like to use.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	9-03-2023	Email TO relevant person	TGS replied to OCEAN's email from earlier in the day, advising they did not receive the email on 06/03/2023. TGS also replied the 20/03/2023 is not suitable, however can do any other day that week and to let them know.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	9-03-2023	Email FROM relevant person	OCEAN requested a reply to their last email.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	9-03-2023	Email FROM relevant person	OCEAN replied to TGS' email from earlier in the day, suggesting TGS missed their email sent 06/03/2023, nominating 20/03/2023 at 5:30 pm.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Otway Climate Emergency Action Network (OCEAN)	9-03-2023	Email FROM relevant person	OCEAN emailed TGS advising they were confused with who is proposing the seismic survey in the Otway Basin, hoping TGS can clarify this and the following queries: - Who is the proponent for this Special Prospector Authority? - What company owns/runs the ship that will be carrying out the survey? - Will TGS be carrying out the survey and if not what exploration company will be completing the survey? OCEAN also noted the original application dated 16/8/2022 on the NOPTA applicant tracking site has not changed, where the company is listed as TGS NOPEC Geophysical Company P/L. OCEAN also commented TGS is currently working with one of their members to organise a consultation meeting and they need to know the above information prior to that meeting and appreciate an early response. OCEAN concluded their email by offering for TGS to contact them if they have any queries or need clarification.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email TO relevant person	TGS provided the following answers to OCEAN's queries emailed to TGS on 09/03/2023: - Survey is a joint venture between SLB and TGS however TGS is taking the lead. - TGS is the lead with both TGS and SLBs name on the Special Prospecting Authority as this is a joint venture. - Currently TGS has not contracted a vessel for the survey as they are still in the process of seeking approval from the regulator to carry out the proposed survey. - TGS will be acquiring the survey. - TGS' Australian entity is TGS-NOPEC Geophysical Company Pty Ltd. TGS closed their email advising they look forward to hearing from OCEAN about a preferred day/time for an online meeting to discuss the proposed survey in more detail.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email TO relevant person	TGS replied to OCEAN's email from earlier in the day, advising they had responded to their previous email on 09/03/2023 stating the 20/03/2023 would not be suitable. TGS provided a copy of this email to confirm they had responded.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email TO relevant person	TGS confirmed 21/03/2023 at 5:30 pm would work and asked if OCEAN had a preference for either Teams or Zoom.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email FROM relevant person	OCEAN replied to TGS' query about a suitable day and time for an online meeting suggesting 20/03/2023 at 5:30 pm and asked if TGS is receiving their emails.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email FROM relevant person	OCEAN apologised for not receiving TGS' response to a suggested meeting day and time and suggested 21/03/2023 at 5:30 pm.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	10-03-2023	Email FROM relevant person	OCEAN replied to TGS' email requesting confirmation of which platform they would prefer for a proposed online meeting with their members on 21/03/2023 at 5:30 pm., advising they would prefer Zoom.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	15-03-2023	Email TO relevant person	TGS emailed out a Zoom meeting invite to OCEAN to share with their members for Tuesday 21/03/2023 at 17:30 hrs AEDT.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	18-03-2023	Email FROM relevant person	OCEAN replied to the Zoom meeting invite that TGS distributed on 15/03/2023. OCEAN advised they have distributed the invite to their members and community and noted the following stipulations for the consultation: Their group wishes to know about the TGS' seismic 3D proposal for the Otway Basin only with time for questions and true consultation rather than receiving information regarding TGS' history, achievements or objectives. They would like a copy of the transcript (or recording) of meeting and an opportunity to vet information that will be fed into the EP resulting from the meeting. They would like to convene the meeting to ensure everyone has a fair opportunity to speak and ask questions. OCEAN advised this will be done with the respect and fairness to TGS representatives and OCEAN members. OCEAN concluded the email thanking TGS for the opportunity.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	21-03-2023	Email TO relevant person	TGS responded to OCEAN's email sent on 18/03/2023 advising the following: As the meeting is for consultation there will be time for questions and will be providing an overview of the meeting; and TGS will not be recording the meeting but will be taking notes and these will be distributed to OCEAN as well as included in the consultation material for the EP.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	21-03-2023	Email TO relevant person	TGS responded to OCEAN's email sent earlier in the day asking who will be presenting at the online meeting later that day. TGS provided details of presenters from TGS and SLR.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	21-03-2023	Phone call FROM relevant person	OCEAN called TGS to discuss how the up-and-coming online meeting later that day would best be managed, given there were going to be so many people. OCEAN suggested all attendees be muted and advised if they wish to ask a question to raise their hand. TGS would then unmute them to ask their question. Both TGS and OCEAN agreed to this approach.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	21-03-2023	Email FROM relevant person	OCEAN emailed TGS to ask for the names of presenters and their roles for the online meeting scheduled that day.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	21-03-2023	Meeting with relevant person	TGS and SLR met with OCEAN members (54 members registered) to provide a presentation detailing the proposed survey, listen to feedback and discuss any questions they had. OCEAN's key queries included: - the large survey area; - trust issues around partnership with SLB; - confirmation of what is an 'acceptable risk level'; - reason and timing for exploring offshore resources with government's target to be 90% renewable by 2035; - impacts to species other than whales; and - compensation for indirect impacts to marine ecology. SLR provided a closing summary advising only some of the measures were discussed due to time restrictions [as an example] and all control measures are extensively detailed in the EP. TGS thanked OCEAN and advised the meeting minutes. The meeting was extended 45 minutes to ensure all questions were asked and addressed. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	24-03-2023	Email FROM relevant person	OCEAN emailed TGS thanking them for the meeting on 21/03/2023, appreciating the team's attempt to answer their questions. OCEAN asked for the following advising they will follow up with more questions from OCEAN members that came about during the meeting: 1.A list of all members who registered for the meeting (priority). 2.A list of all members who attended the meeting (priority). 3.A copy of the slides provided by TGS at the meeting (priority). 4. A (draft) record or transcript of the meeting, for comment. 5.A map of the proposed project overlap with previous and proposed surveys, including other company survey boundaries. 6.Did TGS play any role in the SLB 2019 2D survey of the Otway Basin? If so, what component of that operation. 7.We would like to also double check a question that was asked regarding a GSA. Is TGS or SLB acting in regards to a GSA. 8.Details of the independent observer group that TGS will employ. 9.If this proposal is successful, [they] would like to have a promise from TGS that they will provide all data and reportable incidents relevant to the EP during the project to OCEAN. OCEAN closed the email thanking TGS again.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	29-03-2023	Email TO relevant person	TGS replied to the OCEAN member that emailed TGS earlier in the day. TGS advised that in the meeting held on 21/03/2023, TGS stated the survey would commence from Oct 2023, pending regulatory approval and the EP will be submitted to NOPSEMA for review well before then. If NOPSEMA accept the EP as complete, the EP will be released for public comment for 30 days. TGS advised they cannot provide the sound modelling (JASCO) report now as stated in the meeting as it is being updated to reflect the reduction in survey area but can provide once the report is updated. TGS advised the member there were a lot of comments and subsequent questions at the meeting and they are drafting a response and summarising the meeting and collating the references. TGS advised the member it had only been six working days since the meeting and they will get the information to OCEAN as soon as it is completed, although please do not hesitate to ask if they have any further questions.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	29-03-2023	Email FROM relevant person	An OCEAN member replied to their email sent earlier in the day, thanking TGS for the full and swift reply and asked when they thought the JASCO report would be available.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	29-03-2023	Email FROM relevant person	An OCEAN member emailed TGS directly stating that at the OCEAN meeting on 21/03/2023, TGS said they would be starting seismic testing on 23/10/2023 and commented that is not long for them to submit their viewpoint to NOPSEMA. They also mentioned that it is now almost two working weeks and TGS hasn't responded to the questions and asked for a copy of the JASCO report as soon as possible.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	30-03-2023	Email TO relevant person	TGS replied to the OCEAN member that emailed TGS yesterday enquiring when the JASCO report would be available. TGS advised they should be able to get the JASCO report to them next week.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	30-03-2023	Email FROM relevant person	An OCEAN member replied to the TGS acknowledging their response regarding when the JASCO report would be available.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Otway Climate Emergency Action Network (OCEAN)	3-04-2023	Email FROM relevant person	OCEAN emailed TGS to follow up on the meeting held on 21/03/2023 with the following questions that weren't answered during the session: - Why has Schlumberger's name been removed from the revised information sheet for the reduced area when it is still part of the operation seeking approval for an SPA. - Who made the decision to remove Schlumberger's name, Schlumberger or TGS. These two questions are particularly relevant because [OCEAN] has no confidence in Schlumberger as a reputable company, given its history of criminal fines in the US and the current investigation into its 2019 survey by NOPSEMA. - What is the reason for the reduced size of the proposed survey area in the new information sheet. - TGS stated that the survey was due to commence in October 2023 – but how long will the survey run for. - What is TGS's policy in regard to indirect compensation for fishers as a result of seismic blasting. - Would you please provide those answers to [name removed] questions, and to any questions posted by other people in the chat. - Can OCEAN have clarification on this statement made during the meeting by [name removed]: 'Every single receptor in the marine environment has been assessed and incorporated into the model.' OCEAN understood 'receptor' to mean marine organisms receptive to seismic waves, and 'incorporated into the model' to mean the model for the accessible level of risk. Is this correct. If so, the statement is surely too broad. Every single organism can't have been assessed. - In 2019 Schlumberger seismic blasted over a dumpsite for WWI and WWII chemical and artillery weapons in the Otway Basin. This site was overlooked in the EP prepared by SLR. What assurances can be given that SLR will not overlook similarly dangerous sites in the EP it prepares for the current SPA. - Is TGS concerned about the fact that Schlumberger is under investigation for its 2019 2D seismic blasting project in the Otway Basin, and about Schlumberger's bad global corporate reputation. For example, the fact that in 2015 Schlumberger was handed the biggest corporate criminal fine in US history, and given three years' corporate probation, for sanctions violations in Iran and Sudan. What reassurances can you give that this company is fit to undertake seismic blasting in highly sensitive waters.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	4-04-2023	Email TO relevant person	TGS emailed OCEAN a copy of the minutes from meeting held 21/03/2023 which included a copy of the presentation delivered at the meeting and references verifying the JASCO Acoustic Modelling Report. The email also addressed questions from OCEAN in email received 24/03/2023.	Y - meeting minutes, presentation and acoustic modelling report references.	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	5-04-2023	Email FROM relevant person	An OCEAN member replied to TGS's response to their email on 30/03/2023 asking if they could have the JASCO acoustic modelling report.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	6-04-2023	Email TO relevant person	TGS replied to emailed received on 05/04/2023 from an OCEAN member requesting the acoustic modelling report, advising they are waiting on the final report and will send once they receive it.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	6-04-2023	Email TO relevant person	TGS replied to an email from an OCEAN member received 31/03/2023 thanking them for their time to respond with additional comments, acknowledging and noting their concerns. TGS confirmed in their email the purpose of the proposed seismic survey is to obtain data to inform the oil and gas industry.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	6-04-2023	Email FROM relevant person	An OCEAN member replied to TGS's response to their email sent earlier in the day, thanking TGS.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	14-04-2023	Email TO relevant person	TGS forwarded a list of references regarding plankton that is currently being used in the draft EP, as promised in their email sent to OCEAN on 04/04/2023. TGS noted the EP is still being developed and will be carrying out an in-depth literature review to identify if there is any other information that needs to be incorporated in the EP.	Y - list of references regarding plankton	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	14-04-2023	Email TO relevant person	TGS replied to email received from OCEAN on 03/04/2023 with various questions. The following information was provided in summary: - Survey is being lead by TGS under their policies and procedures etc with joint venture partners, SLB. - The reduced survey area is from relevant person feedback and no acreage release in SA. - First phase (between 6-7,000 km2) between 4-6 months pending weather and mitigation measures. - TGS is developing a commercial fishing loss adjustment protocol that will be consistent with the NERA protocol. - Answers to James Dunbar's questions were provided on 04/04/2023. - Receptors assessed in the modelling were extensive (list provided). - The extensive review process and ability for any party to comment and review the EP provides assurance there is little opportunity for anything to be overlooked. Additionally, the dumpsite has been excluded from the survey. - TGS obtains all necessary permits including any related assessments and analyses and they conduct survey acquisition in accordance with applicable law and such permits. TGS and SLB collaborate on various projects globally. Regarding the Otway 2D proposal, SLB obtained all necessary approvals, operating in accordance with applicable and such permits and is cooperating with NOPSEMA regarding all compliance matters. TGS then clarified and explained a term misused by OCEAN - seismic surveys do not 'blast' nor does the technology produce blasts. Refer to Appendix H for detailed response.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	17-04-2023	Email TO relevant person	TGS replied to OCEAN's email sent earlier in the day and provided a record of recent correspondence TGS had sent to OCEAN including answering questions they had asked in previous correspondence. TGS explained their consultation process was currently occurring to inform their environmental plan, processing a high level of information. TGS continued that in some cases they required specialist input which can cause delays in their response to relevant persons and is the reason OCEAN had not yet received a report they were waiting for. TGS noted OCEAN's concerns with ensuring they have adequate time to review the report but reassured OCEAN they would receive the report once TGS had received it and had it reviewed by SLR. TGS also advised the OCEAN member that once the EP was finalised, submitted to NOPSEMA and NOPSEMA accept it as complete, it will be publicly available for submission for 30 days. TGS closed their email thanking them for their patience.	N	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	17-04-2023	Email FROM relevant person	An OCEAN member emailed TGS commenting it has almost been a month since the online meeting and they understood, answers have not been sent to OCEAN and the member has not yet received the underwater acoustic modelling report. The member also stated they had been advised by NOPSEMA they had not yet received an EP for assessment (for the proposed Otway 3D MSS) as it is still being prepared by the titleholder. NOPSEMA advised the member the consultation session and any response provided by RPs will be an important aspect of the EP and will be considered by NOPSEMA during the assessment process. NOPSEMA also recommended the member provide a submission to TGS (or SLR) outlining any additional information they need to make an informed assessment of potential consequences of the activity, and any claims or objections they may have that relate to the environmental management of the activity and the potential impacts and risks.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	17-04-2023	Email FROM relevant person	OCEAN replied to the email response TGS had sent earlier that day, thanking them for their detailed and rapid response and apologised for the lack of coordination on their side and they had now received all of TGS' replies. OCEAN advised the source about JASCO provided to them was insufficient for them to know what evidence TGS is using. OCEAN also advised they wish to see the report on which TGS will be basing their submission to NOPSEMA. OCEAN closed their email noting they are aware of the 30 days in which they can respond but would rather do their [review] now and let TGS know their results.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	19-04-2023	Email TO relevant person	TGS emailed OCEAN a copy of the underwater acoustic modelling report to the OCEAN member whom requested it 06/04/2023, as latest version was now available.	Y - Underwater acoustic modelling report	N/A	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	19-04-2023	Email FROM relevant person	OCEAN member replied to TGS' email sent earlier that day providing them the underwater acoustic modelling report thanking TGS.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	22-04-2023	Email FROM relevant person	An OCEAN member emailed TGS having reviewed the minutes from the meeting held with OCEAN on 21/03/2023. The member advised they are not listed as attending and asked for the minutes to be updated to include those who attended or asked questions.	N	Continuing consultation	* (see note above table)	Continuing consultation
Otway Climate Emergency Action Network (OCEAN)	24-04-2023	Email TO relevant person	TGS replied to the email from the OCEAN member received 22/04/2023 providing amended meeting minutes to include their name.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
Otway Climate Emergency Action Network (OCEAN)	24-04-2023	Email FROM relevant person	An OCEAN member acknowledged TGS' email sent to them earlier that day providing amended meeting minutes as requested.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	5-05-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is seeking feedback about their 3D marine seismic survey proposed for the Otway Basin. TGS continued they have identified PWS as a potential relevant person and would like to meet with PWS to explain the survey and discuss any queries they have. TGS explained PWS would assist with identifying the local environmental values and sensitivities that TGS needs to consider within and around the survey area.Additionally they would like to know how the survey could potentially impact PWS' functions, interests or activities and explain some control measuers TGS is implementing to minimise impacts. TGS closed the enquiry by asking PWS to contact them to arrange a suitable date and time to meet (contact details provided).	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	5-05-2023	Email FROM relevant person	Automated reply to TGS' online enquiry form submitted earlier that day advising request had been received and PWS' customer service team will be reviewing the request and forwarded to the appropriate management team.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	9-05-2023	Phone call TO relevant person	TGS called PWT regarding their proposed marine seismic survey to follow up on an online querye TGS submitted last week. PWT suggested an alternative to contact (provided contact details).	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	9-05-2023	Email TO relevant person	TGS emailed PWT seeking feedback on their proposed marine seismic survey within the Otway Basin. TGS enclosed an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Parks and Wildlife Tasmania	9-05-2023	Phone call TO relevant person	TGS called PWT - King Island Field office regarding their proposed marine seismic survey but there was no answer so left a message for them to return their call, leaving contact details.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	9-05-2023	Email TO relevant person	TGS replied to PWT's email received earlier that day thanking them for their help.	N	N/A	* (see note above table)	Continuing consultation.
Parks and Wildlife Tasmania	9-05-2023	Email FROM relevant person	PWT replied to TGS' email sent earlier that day thanking them for their call and email. PWT advised the email has been delivered to the Park Entry/Passes team email address who do their best to forward to the most appropriate staff member/area. PWT advised they had forwarded TGS' email to the Parks and Wildlife field centre on King Island for response as they are geographically the closest to the area outlined for the project. PWT provided their contact details to follow up.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks and Wildlife Tasmania	12-05-2023	Email TO relevant person	TGS emailed PWT King Island field office to provide them information about the proposed marine seismic survey within the Otway Basin. TGS advised they met with Aboriginal Heritage Tasmania and suggested contacting PWT and PWT main office referred TGS to the King Island field office. TGS said it would be great to meet with them to discuss the project further and provided contact details and to advise when is convenient. TGS provided background information within the email and attached the information sheet.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Parks and Wildlife Tasmania	15-05-2023	Phone call TO relevant person	TGS called PWT King Island field office to follow up on their email sent 12/05/2023 regarding their proposed marine seismic survey. PWT KI advised they didn't believe the survey was relevant as it is based offshore and their jurisdiction is on land. PWT suggested they are best to consult King Island Landcare (contact details provided).	N	N/A - not relevant	N/A	Consultation closed
Parks Victoria	5-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS advised they will be visiting Tasmania later that week if they'd like a for a meeting.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Parks Victoria	5-05-2023	Email FROM relevant person	PV replied to TGS' email sent earlier that day advising they have forwarded TGS' enquiry to the appropriate management team.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks Victoria	29-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 02/06/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Parks Victoria	29-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 02/06/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Parks Victoria	29-05-2023	Email FROM relevant person	Automated reply to TGS' email sent earlier that day advising they have forwarded TGS' enquiry to the appropriate management team.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parks Victoria	29-05-2023	Email FROM relevant person	PV replied to TGS' email sent earlier that day advising they have forwarded TGS' enquiry again and will let them know TGS has been in contact with them.	N	Continuing consultation	* (see note above table)	Continuing consultation
Parradarrama Pungenna Aboriginal Corporation	27-04-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 05/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Parradarrama Pungenna Aboriginal Corporation	28-04-2023	Phone call TO relevant person	TGS followed up email sent to PPAC regarding their proposed marine seismic survey within the Otway Basin. TGS advised they are visiting Hobart next week and would welcome a meeting. PPAC said they hadn't seen the email yet but would locate it and call TGS back.	N	Continuing consultation	* (see note above table)	Continuing consultation
PIRSA Fisheries & Aquaculture South Australian Research and Development Institute (SARDI) Aquatic Sciences	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Map of survey relative to South Australian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation.
PIRSA Fisheries & Aquaculture South Australian Research and Development Institute (SARDI) Aquatic Sciences	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Port Fairy Community	29-05-2023	Community information session	TGS, SLB and SLR arranged a community information session to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries: - liaising with traditional owner groups; - decrease in rock lobster catch following past survey; - confusion with multiple activities occuring similar time; - impacts and controls for marine mammals; - how noise behaves in the ocean; and - need for survey. The main community concerns would be impact to local tourism and fishing. Refer to Appendix I for detailed meeting minutes.		The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Consultation with traditional owner groups: **Section 5.5.7** Effects to rock lobster (and past surveys): **Section 7.1.3.1.2** Victoria Fisheries- Rock Lobster), **Section 7.1.3.1.5** (Summary of Potential Impacts to Commercial Fisheries), **Section 7.2.2.2.1** (acoustic effects to plankton, includingn rock lobster larvae), **Section 7.2.2.2.1.4** (acoustic effects on Rock Lobster Larvae). It is noted the Giant Crab Acoustic Exclusion Area also provides for protection to rock lobster (see **Table 81**). Effects of multiple activities: Aspects regarding recovery periods and previus surveys are adressed in **Section 9** Cumulative Effects. Further to this, outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP. Effects to marine mammals: **Section 4.5.6** (summary of existing knowledge of marine mammals), **Section 7.1.2.2** (effects of the physical presence of the Seismic Survey to marine mammals), **Section 7.2.2.2.7** (acoustic disturbance effects to marine mammals), Section **8.3.3.2.5** (effects of a hydrocarbon spill to marine mammals) Underwater noise behaviour: **Section 7.2.1.2** (underwater acoustic modelling) Survey purpose/requirement: **Section 1.2** (purpose and objectives) Effects to local tourism and fishing: **Section 7.1.3.1.1** (impacts of the physical presence of the seismic survey vessel and equipment), **Section 7.2.3.1** (acoustic imapacts) and **Section 8.3.4.1** (hydrocarbon spill) Recreation and tourism: **Section 7.1.3.3** (impacts of the physical presence of the seismic survey vessel and equipment), **Section 7.2.3.2** (acoustic imapcts on recreational dive operators), **Section 8.3.4.3** (hydrocarbon spill). Ongoing consultation with the Port Fairy Community will be undertaken in accordance with the methods set out in Section 5 to ensure the Community have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Port Phillip EcoCentre	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Port Phillip EcoCentre	24-04-2023	Email TO relevant person	TGS emailed PPEC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked PPEC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Port Phillip EcoCentre	18-05-2023	Email FROM relevant person	PPEC emailed TGS responding to email TGS sent 24/04/2023. PPEC advised their response was high level given the broad area that may be affected and time, however would be pleased to meet with TGS to elaborate on their response. PPEC provided background information about the EcoCentre and a summary of key concerns and considerations (based on their desktop research and a review of the information sheet), including: - Not enough available information on potential survey impacts to ensure negative impacts to the marine environment are avoided. - Impact to marine fauna (including endangered and listed species) given proximity to Bonney Upwelling. - Impacts on wildlife - pelagic fish species. - Research into the effects of surveying on fish catch rates has found near-total depletion of whiting in affected areas. Noted the information sheet TGS provided does not reference fish species, lobsters or penguins and does not mention impacts of acoustic energy deployed by the seismic survey vessel. PPEC then posed the following two questions: 1. what existing studies on impacts of seismic surveys on pelagic schooling fish are available; and 2. what methods are proposed to acheive the "detailed impact assessment being undertaken to understand the potential impacts to marine fauna and identify appropriate management measures". Refer to Appendix H for detailed submission.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Current status of comemrcial fisheries: Section 4.7.3 (including catch rates/efforts) Effects to commercial fishing industry: Section 7.1.3.1 (impacts of the physical presence of the seismic survey vessels), Section 7.2.3.1 (imapcts of acoustic disturbacne on fisheries), Section 8.2.3 (imapct of streamer loss), Section 8.3.4.1 (hydrocarbon spill), and Table 84 includes control measures for adressing commercial fishers compensation in accordance with agreed protocols. Table 84 lists the control measure for compensation to fishers for any claims received in accordance with the agreed compensation protocol. Cumulative impacts: Table 84 lists control measures to require a SIMOPS plan, which inlcudes the implementation of a 40 km spatial separation between Seismic Vessels. Section 9 sets out the approach to manageing Cumulative Impacts. Impacts on wildlife (pelagic fish species): Section 7.2 and subsections therein (Section 7.2.2.1 (Noise effect criteria, and Section 7.2.2.3.2 effects of acoustic deisturbance to bony fish), Section 8.3.3.2.3 (effects of a hydrocarbon spill on bony fish and elasmobranchs). Methods to acheive the "detailed impact assessment being undertaken to understand the potential impacts to marine fauna and identify appropriate management measures": Section 6 Environmental Impact and Risk Assessment Methodology described the risk assessment process, to ensure all effects are at Acceptable Levels, and are reduced to ALARP. Ongoing consultation with PPEC will be undertaken in accordance with the methods set out in Section 5 to ensure PPEC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Port Phillip EcoCentre	20-05-2023	Email TO relevant person	TGS replied to PPEC's email received the day before thanking them for their detailed response regarding their proposed Otway Basin seismic survey and confirmed TGS would be keen to meet so PPEC can further elaborate on their response. TGS clarified the information sheet was high level summary of the survey as the environment plan (EP) is being developed, however the EP covers a lot of questions they raised. TGS asked if they are available to meet 01/06/2023 and whether any other members would be attending the meeting.		N/A	* (see note above table)	Continuing consultation.
Port Phillip EcoCentre	23-05-2023	Email FROM relevant person	PPEC emailed TGS responding to email TGS sent earlier that day advising that MS Teams will work for their meeting to discuss the proposed marine seismic survey and asked if they could shift the meeting to a slightly earlier to accommodate another meeting following their meeting with TGS.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Port Phillip EcoCentre	23-05-2023	Email TO relevant person	TGS replied to PPEC's email received earlier that day regarding meeting date and time and confirmed 07/06/2023 for an online meeting. TGS asked whether Microsoft Teams was ok for an online meeting platform and offered to send a meeting invite out.	N	N/A	* (see note above table)	Continuing consultation.
Port Phillip EcoCentre	23-05-2023	Email FROM relevant person	PPEC replied to TGS' email sent earlier that day confirming Microsoft Teams works for them and said they have another meeting following the TGS meeting so would appreciate finishing slightly earlier and could adjust the start time if necessary.	N	N/A	* (see note above table)	Continuing consultation.
Port Phillip EcoCentre	23-05-2023	Email TO relevant person	TGS emailed an online meeting invite to PPEC for 07/06/2023.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Port Phillip EcoCentre	7-06-2023	Meeting with relevant person	TGS, SLB and SLR met with PPEC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with PPEC: - Agency providing environmental approval; - Aerial surveys (marine fauna monitoring); - Impacts on fish; - Environment plan development and approval process; - Survey timing; - Consultation with other groups; - Marine fauna observers; and - Impacts on endangered species and other non-whale species. Refer to Appendix H for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Purpose of the EP: **Section 1.2** Sound propagation and underwater acoustic modelling: **Section 7.2.1.2** (Underwater Acoustic Modelling) Impacts to commercially relevant species: **Section 7.1.3.1** (Seismic Survey physical presence: Potential Impacts and Risks to Commercial Fishing Operations), **Section 7.2.3.1** (Acoustic disturbance - Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries), **Section 8.2.3** (Streamer loss - Evaluation of Known and Potential Impacts and Risks to Other Marine Users), **Section 8.3.4.1** (Hydrocarbon spill - Potential Impacts and Risks to Commercial Fishing). EP Impact and risk assessment process: **Section 6** (Environmental Impact and Risk Assessment Methodology). Impacts to plankton (outside of survey area): effects to plankton outide the survey area primarly related to the risk of unplanned activities (**Section 8**), in particular **Section 8.3** (hydrocarbon release) , with **Section 8.3.3.2.2** (hydrocarbon spill effects to Zooplankton, Fish Eggs and Larvae) assessed. Commercial fishers compenstation protocol: **Section 7.2.3.1** (Acoustic disturbance: Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries) describes the Commercial fisheries compensation protocol, with Control Measures listed in **Table 84**. Direct inshore impacts: Primarily related to effects of Unplanned Activities (**Section 8**), in partivular effects to nearshore environments of a hydrocarbon spill (**Section 8.3.3.4** - Potential Impacts and Risks to Coastal Marine Environment of an accidental hydrocarbon spill, including effects to nearshore waters) Fauna monitoring during survey: **Section 10.6** (reporting) sets out all reporting and monitoring requiremetns, including **Section 10.6.2** (Marine Fauna Reporting) and **Section 10.6.3** (Reportable and Recordable Incident Reporting) Effects to marine mammals: Sections 7.2.2.3.6 and 7.2.2.4.2 (Acoustic imapcts to marine mammals with control measures specific for marine mammals listed in Table 84), and Section 8.3.3.2.5 (effects of a hydrocarbon spill to marine mammals). Ongoing consultation with PPEC will be undertaken in accordance with the methods set out in **Section 5** to ensure PPEC had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Ports of Melbourne Authority	16-02-2023	Email TO relevant person	TGS advised PoM of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ports of Melbourne Authority	24-04-2023	Email TO relevant person	TGS emailed PoM to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked PoM to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ports of Melbourne Authority	4-05-2023	Email TO relevant person	TGS replied to PoM's email acknowledging PoM's comment they have no meaningul input to give and queried whether PoM would like to remain on the consultation list to receive updates or would they prefer to be removed.	N	N/A	* (see note above table)	Continuing consultation.
Ports of Melbourne Authority	4-05-2023	Email FROM relevant person	PoM replied to TGS' email sent 24/04/2023 advising they had discussed with their team and as the survey is quite away from the PoM area, they don't have any meaningful input to give and thanked TGS for checking with them.	N	Continuing consultation	* (see note above table)	Continuing consultation
Ports of Melbourne Authority	4-05-2023	Email FROM relevant person	PoM replied to TGS' email sent earlier that day advising they'd like to remain on the consultation list.	N	Continuing consultation	* (see note above table)	Continuing consultation
Ports of Melbourne Authority	5-05-2023	Email TO relevant person	TGS replied to PoM's email sent earlier that day confirming TGS will keep them in their consultation program so they can keep updated with their progress. TGS closed the email advising PoM to let them know if any queries arise.	N	N/A	* (see note above table)	Continuing consultation.
Ports Victoria	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Ports Victoria	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Ports Victoria	17-02-2023	Email FROM relevant person	Response to previous email from TGS requesting additional email address be included within the distribution list for communications around the survey they can forward safety information to vessels (via agents) calling at the Port of Portland.	Y - Updated information sheet	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Ports Victoria	20-02-2023	Email TO relevant person	Acknowledgement of previous email and offer to forward safety information to vessels calling at Port of Portland.	N	N/A	* (see note above table)	Continuing consultation.
Primary Industries and Regions SA	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Map of survey relative to South Australian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation.
Primary Industries and Regions SA	12-05-2022	Email FROM relevant person	Email undeliverable to one stakeholder email account. Note, other PIRSA contacts were successfully emailed.	N	Continuing consultation	* (see note above table)	Continuing consultation
Primary Industries and Regions SA	28-06-2022	Email FROM relevant person	The stakeholder attached a response to the survey and recommended that TGS/Schlumberger consult directly with the South Eastern Professional Fishermen's Association, the Marine Fishers Association of South Australia and the Australian Southern Bluefin Tuna Industry Association.	Y - Response to the survey	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised. The relevant associations/contacts are confirmed contacted.	* (see note above table)	No action required. Continuing consultation.
Primary Industries and Regions SA (PIRSA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Primary Industries and Regions SA (PIRSA) - South Australian Rock Lobster Fishery	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
RecFish SA	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
RecFish SA	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
RecFish SA	24-04-2023	Email TO relevant person	TGS emailed RSA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked RSA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
RecFish SA	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
RecFish SA	22-05-2023	Phone call TO relevant person	SLB called RFSA to follow up on unanswered emails TGS has sent regarding their proposed seismic survey. Key comments from the call included: - Seismic testing not perceived well in SA. - Past concerns related to impacts of survey on southern blue fin tuna and lobster larvae in the water column due to the local fisheries relying on the currents from Victoria to receive their eggs and larvae. - Seismic testing cause panic amongst industry due to potential effects on the embryos within the eggs and suspended larve. - Surveying is to acquire subsurface data for oil and gas exploration, carbon capture and storage but doesn't necessarily mean they will be any development. RFSA confirmed they've had sufficient information about the project but would like additional details about impacts on lobster larvae and embryos. RFSA also confirmed they've had enough time and will follow up the phone call with an email confirming their position. Refer to Appendix I for detailed call record.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Imapcts of the seismic survey activity for commercial fishers, specifically in relation to underwater noise are discussed in detail in **Section 7.2.3.1.** Other specific impacts are discussed in detail in **Section 7.2.2.3.2** (bony fish / tuna behavioural impacts), and **Section 7.2.2.2.1.2** (duration and extent of zooplankton exposure), **Section 7.2.2.2.1.4** (rock lobster larvae) and **Section 7.2.2.2.3.2** (bony fish larvae). Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP.	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
RecFish SA	30-05-2023	Email FROM relevant person	RSA emailed TGS following phone call conversation with SLB on 22/05/2023 and email TGS sent 19/05/2023. RSA advised they are responding in the absence of the information they have requested regarding the effect of seismic testing on lobster larvae and eggs due to timeframe requested. RSA advised they are a nationally recognised peak body for 360,000 fishers within South Australia and the response provided is representative of the community's views and expectations. RSA continued that due to the heightened concern of environmental issues regarding wind energy in SA/Vic and seismic testing, RSA strongly discourage seismic testing due to the potential effect on: - Whale and marine mammal interaction or damage; - Suspended Lobster egg and larvae disruption/destruction; - Migratory fish dispersal (Southern Blue Fin Tuna); and - Sardine impact and/or pelagic egg destruction. RSA added that with little data understood, particularly regarding Southern Rock Lobster prevalent within this region, the environmental risk is too great to encourage or endorse.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Effects to marine mammals: **Sections 7.2.2.3.6** and **7.2.2.4.2** (Acoustic imapcts to marine mammals with control measures specific for marine mammals listed in **Table 84**), and **Section 8.3.3.2.5** (effects of a hydrocarbon spill to marine mammals). Effects to migratory fish (Southern Blue Fin Tuna): **Section 7.1.3.1.1.6** (Southern Bluefin Tuna Fishery) regarding an assessment of the effects of the physical presence of the Seismic Survey; Effects to fisheries and effects to (pelagic) larval/egg stages: **Section 7.2.2.3.2** (bony fish / tuna behavioural impacts), and **Section 7.2.2.2.1.2** (duration and extent of zooplankton exposure), and **Section 7.2.2.2.3.2** (bony fish larvae). Effects to Southern Rock Lobster and effects to egg/larvae: **Section 7.2.2.2.1.4** (rock lobster larvae). Ongoing consultation with RecFish SA will be undertaken in accordance with the methods set out in **Section 5** to ensure RecFish SA have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
RecFish SA	15-06-2023	Email TO relevant person	TGS replied to RSA's email received 30/05/2023 thanking them for their information. TGS advised they acknowledge and have noted their comments and concerns regarding their proposed activity and provided the following summarised comments: - Explanation of and update on EP submission process and status. - Public consultation period opportunity to provide feedback, alternatively can arrange a meeting to explain marine seismic surveying, provide a project overview and discuss their concerns. - EP contains extensive assessment of potential impacts to marine fauna (including those RSA listed). - EP also includes information about impacts to commercial fishing and the species RSA mentioned in their submission. TGS also advised they are preparing an information sheet discussing the impacts to marine fauna to provide to RSA, otherwise to advise whether they would like to meet or any other specific information that will help them.	N	N/A	* (see note above table)	Continuing consultation.
Roads and Maritime Services (NSW)	22-05-2023	Email TO relevant person	TGS emailed RMS seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from RMS to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked RMS to reply prior to 26/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Scallop Fishermen's Association of Tasmania Incorporated also Bass Strait Central Zone Scallop Fishery	19-05-2023	Email FROM relevant person	SFATI replied to TGS' email sent earlier that day advising the survey is not over known scallop grouds so is of no great concern to them, however asked if they could be kept informed of their activities.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Scallop Fishermen's Association of Tasmania Incorporated also Bass Strait Central Zone Scallop Fishery	19-05-2023	Email TO relevant person	TGS replied to SFATI's reply email received earlier that day thanking them and confirming they will keep them up to date with their activities. TGS also asked whether they represent the Bass Strait Scallop Industry Association as well as the SFATI.	N	N/A	* (see note above table)	Continuing consultation.
Scallop Fishermen's Association of Tasmania Incorporated also Bass Strait Central Zone Scallop Fishery	19-05-2023	Email FROM relevant person	SFATI replied to TGS' email sent earlier that day advising they are the executive officer for the SFATI which represents all scallop fishermen and processors in both Tasmania and Bass Strait Central Zone fisheries.	N	N/A	* (see note above table)	Continuing consultation.
Scallop Fishermen's Association of Tasmania Incorporated also Bass Strait Central Zone Scallop Fishery	19-05-2023	Email TO relevant person	TGS replied to SFATI's reply email received earlier that day thanking them for their reply.	N	N/A	* (see note above table)	Continuing consultation.
Scuba Divers Federation of South Australia, Inc	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Scuba Divers Federation of South Australia, Inc	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Scuba Divers Federation of South Australia, Inc	24-04-2023	Email TO relevant person	TGS emailed SDFSA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SDFSA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Scuba Divers Federation of South Australia, Inc	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	N	N/A	* (see note above table)	Continuing consultation.
SCUBA Divers Federation of Victoria	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
SCUBA Divers Federation of Victoria	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
SCUBA Divers Federation of Victoria	24-04-2023	Email TO relevant person	TGS emailed SDFV to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SDFV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
SCUBA Divers Federation of Victoria	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited AFMA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	2-06-2022	Email FROM relevant person	Meeting request response stating 'tentaive' for a meeting scheduled for the 2 June 2022 11:00 AM to 12:00PM (UTC+08:00) Perth.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Australia (SIA)	03-06-2022	Email FROM relevant person	SIA declined an invitation to a stakeholder meeting to be held June 9th 12:30-1:30pm AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Australia (SIA)	03-06-2022	Email FROM relevant person	SIA declined an invitation to a stakeholder meeting to be held June 10th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Australia (SIA)	23-06-2022	Email FROM relevant person	SIA declined an invitation to a stakeholder meeting to be held June 29th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Australia (SIA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	24-04-2023	Email TO relevant person	TGS emailed SIA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SIA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	24-04-2023	Email FROM relevant person	SIA responded to email TGS sent earlier that day advising they had passed TGS' email on to the appropriate stakeholders and thanking TGS for their contact.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Seafood Industry Australia (SIA)	26-04-2023	Email TO relevant person	TGS replied to email from SIA received 24/04/2023 thanking them for their response and passing on to relevant stakeholders. TGS asked if SIA could advise who the relevant stakeholders that SIA represent and sent information to, to avoid doubling up communications. TGS also said it would be good to meet with SIA to introduce themselves and discuss what is currently being proposed. TGS advised they are preparing their environmental plan for submission to NOPSEMA and want to ensure their consultation with all relevant parties within the seafood industry is appropriate.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Australia (SIA)	22-05-2023	Email TO relevant person	TGS emailed SIA seeking clarification on which associations or organisations they represent as they are in the final stages of preparing their environmental plan to submit to NOPSEMA for completeness check and need to explcitly state who they have consulted with.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Maps of Victorian fisheries having the potential to be affected - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	13-05-2022	Email TO relevant person	TGS state they are contacting SIV to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of the three Victorian fisheries	N/A	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	31-05-2022	Email FROM relevant person	The stakeholder advised that TGS/Schlumberger should reach out to their board to see who can attend a stakeholder meeting on June 2 2022.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Seafood Industry Victoria (SIV)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited SIV to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	01-06-2022	Email TO relevant person	TGS/Schlumberger explained that they forwarded a meeting invitation to the Board Directors listed on the SIV website, but noted that there were currently no representatives for Ocean Access or Rock Lobster. TGS/Schlumberger expressed a desire to engage further with SIV to determine level of interest and best approach for engaging with fishers.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	2-06-2022	Email TO relevant person	TGS forwarded a meeting invitation to the Board Directors listed on their website, at SIVs suggestion.	N	N/A	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	02-06-2022	Email FROM relevant person	SIV declined an invitation to a stakeholder meeting to be held June 2nd 11:00am-12:00pm AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	06-06-2022	Email FROM relevant person	SIV declined an invitation to a stakeholder meeting to be held June 10th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	06-06-2022	Email FROM relevant person	SIV declined an invitation to a stakeholder meeting to be held June 9th 12:30-1:30pm AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	09-06-2022	Meeting with relevant person	Stakeholder attended a meeting where they represented SIV and the Abalone Industry Association (Eastern Zone) (see meeting discussion under this stakeholder title).	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	22-06-2022	Email TO relevant person	TGS/Schlumberger expressed their desire to engage further with this stakeholder so that all potentially affected fishers have had a reasonable opportunity to respond to the proposal. TGS/Schlumberger expressed a desire to organise a meeting with SIV prior to the submission of a formal response and requested SIV provide available dates/times.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	24-06-2022	Email FROM relevant person	SIV declined an invitation to a stakeholder meeting to be held June 29th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	05-07-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for making the time to call and talk through the proposed survey earlier that day. The stakeholder explained that they do not feel the need to provide comment via the consultation process. The stakeholder did request additional information regarding the location of the proposed survey. The stakeholder explained that based on the location of the survey, they would be able to provide the contact details for potentially impacted fishers.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Seafood Industry Victoria (SIV)	05-07-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for the clarification, and accepted the offer of providing contact details for potentially affected fishers.	Y - Information Sheet - Maps of Victorian and Commonwealth fisheries having the potential to be affected - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	13-07-2022	Email TO relevant person	TGS followed up with the stakeholder regarding the stakeholder providing contact details for potentially affected Victorian fishers.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	29-07-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for the information attached in the previous email. They explained that they have passed the details onto SIV members along with the contact details for TGS/Schlumberger.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Seafood Industry Victoria (SIV)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	11-04-2023	Email TO relevant person	TGS emailed SIV to arrange an online meeting to discuss recent changes to their proposed marine seismic survey, acknowledging their current high level of information requests. TGS advised they have had a change of environmental consultant and would like to update them on their progress with their EP and ensure they are addressing any concerns or queries they may have before submitting their EP to NOPSEMA for consideration. TGS closed the email asking them to advise a suitable date and time for an online meeting and they will arrange. TGS attached the updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	11-04-2023	Email TO relevant person	TGS replied to SIV's email reply received earlier that day thanking them for their reply. TGS confirmed a meeting on 26/04/2023 at 11:00 am would suit best and they can send out a meeting invite once SIV confirm suitable.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	11-04-2023	Email FROM relevant person	SIV replied to TGS' email sent earlier that day acknowledging that email. SIV advised there has been a change in CEO and provided updated contact details. SIV said an online meeting would be a good idea and thanked TGS for providing the latest information sheet. The CEO suggested a meeting time for 26/04/2023 either between 11 - 2 pm or 3:30 - 5 pm or any time 28/04/2023 and asked TGS to advise if they don't suit and they will provide some other options.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	12-04-2023	Email TO relevant person	TGS emailed meeting invite to SIV for 26/04/2023 at 1:00 pm.	N	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	12-04-2023	Email FROM relevant person	SIV replied to TGS' email confirming a meeting date and time. SIV confirmed 26/04/2023 at 11:00 am suits them and will look out for meeting invite.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	26-04-2023	Meeting with relevant person	TGS, SLB and SLR met with SIV to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries and concerns with SIV: - Recently appointed CEO and therefore learning all. - Discussed queries from their Board: reason for reduction in survey area, length of the streamers, and size of first phase (6,500 - 7,000 km^2), exclusion zone around equipment and communicating with AMSA. - Purpose and current status of the environment plan (EP). - Sound propagation and underwater acoustic modelling. - Impacts to commercially relevant species. - EP impact and risk assessment process. - Concerns relate to impacts to plankton > effects on fishing outside of survey area. - Commercial fishers compenstation protocol. - Clarification of SIV's representation. - Direct inshore impacts. - Fauna monitoring during survey. TGS closed the meeting offering SIV to contact them with any further queries. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Purpose of the EP: **Section 1.2** Sound propagation and underwater acoustic modelling: **Section 7.2.1.2** (Underwater Acoustic Modelling) Impacts to commercially relevant species: **Section 7.1.3.1** (Seismic Survey physical presence: Potential Impacts and Risks to Commercial Fishing Operations), **Section 7.2.3.1** (Acoustic disturbance - Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries), **Section 8.2.3** (Streamer loss - Evaluation of Known and Potential Impacts and Risks to Other Marine Users), **Section 8.3.4.1** (Hydrocarbon spill - Potential Impacts and Risks to Commercial Fishing). EP Impact and risk assessment process: **Section 6** (Environmental Impact and Risk Assessment Methodology). Impacts to plankton (outside of survey area): effects to plankton outide the survey area primarly related to the risk of unplanned activities (**Section 8**), in particular **Section 8.3** (hydrocarbon release) , with **Section 8.3.3.2.2** (hydrocarbon spill effects to Zooplankton, Fish Eggs and Larvae) assessed. Commercial fishers compenstation protocol: **Section 7.2.3.1** (Acoustic disturbance: Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries) describes the Commercial fisheries compensation protocol, with Control Measures listed in **Table 84**. Direct inshore impacts: Primarily related to effects of Unplanned Activities (**Section 8**), in partivular effects to nearshore environments of a hydrocarbon spill (**Section 8.3.3.4** - Potential Impacts and Risks to Coastal Marine Environment of an accidental hydrocarbon spill, including effects to nearshore waters) Fauna monitoring during survey: **Section 10.6** (reporting) sets out all reporting and monitoring requiremetns, including **Section 10.6.2** (Marine Fauna Reporting) and **Section 10.6.3** (Reportable and Recordable Incident Reporting) Ongoing consultation with SIV will be undertaken in accordance with the methods set out in **Section 5** to ensure SIV has had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Seafood Industry Victoria (SIV)	15-05-2023	Email TO relevant person	TGS emailed SIV the minutes from their meeting on 26/05/2023. TGS also provided some of the information discussed during the meeting and advised the remaining information would be provided in due course. TGS closed the email thanking SIV for meeting with them and offered for SIV to contact them if they had any amendments to the minutes or queries.	Y - Meeting minutes and underwater acoustic modelling report	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	16-05-2023	Email TO relevant person	TGS replied to SIV's email received earlier that day with an amendment to the meeting minutes, advising the amendment had been made. TGS also commented they look forward to receiving information about their service model.	Y - Amended meeting minutes	N/A	* (see note above table)	Continuing consultation.
Seafood Industry Victoria (SIV)	16-05-2023	Email FROM relevant person	SIV replied to TGS' email sent the day before providing meeting minutes. SIV requested a minor amendment to text in the minutes and commented they look forward to receiving the summaries as soon as they are available. SIV advised they are looking at a revised service model to ensure the organisation is properly resourced to undertake consultation with the wider industry on behalf of third parties, and commented they look forward to presenting the information to TGS in due course.	N	Continuing consultation	* (see note above table)	Continuing consultation
Seafood Industry Victoria (SIV)	16-05-2023	Email FROM relevant person	SIV replied to TGS' email sent earlier that day thanking TGS for their email [and amended minutes].	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Six Rivers Aboriginal Corporation	29-03-2023	Email TO relevant person	TGS emailed SRAC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided by 05/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	11-04-2023	Phone call TO relevant person	TGS called SRAC regarding their proposed marine seismic survey within the Otway Basin, however the number was not connected.	N	Continuing consultation	* (see note above table)	Continuing consultation
Six Rivers Aboriginal Corporation	11-04-2023	Email TO relevant person	TGS emailed SRAC to follow up on email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS advised they have tried to contact via phone but the number is not connected and asked if there was a phone number they can be contacted on. TGS advised they would like to meet SRAC online to discuss the proposed survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss. TGS closed the email by thanking SRAC.	N	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	17-04-2023	Phone call TO relevant person	TGS called SRAC regarding their proposed marine seismic survey within the Otway Basin, however the number was not connected.	N	Continuing consultation	* (see note above table)	Continuing consultation
Six Rivers Aboriginal Corporation	17-04-2023	Email TO relevant person	TGS emailed SRAC following a phone call made earlier in the day that did not appear to be connected. TGS advised they were emailing in regards to their marine seismic survey within the Otway Basin and had tried to contact via phone but the number was not connected. TGS asked if there was a number SRAC could be reached on as would really like to meet them and those in the organisation that would be interested to hear about their plans and discuss any concerns they have. TGS advised they could arrange an online meeting at their convenience to discuss. TGS closed the email thanking SRAC, advising they look forward to hearing back from them.	N	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	26-04-2023	Phone call TO relevant person	TGS called SRAC but the number was still not connected.	N	Continuing consultation	* (see note above table)	Continuing consultation
Six Rivers Aboriginal Corporation	26-04-2023	Email TO relevant person	TGS messaged the General Manager of SRAC via LinkedIn explaining they had been trying to make contact with SRAC regarding their proposed offshore seismic project in the Otway. TGS advised they had attached information and asked if there was a better email address they could use to contact SRAC. TGS closed their message by saying they would really like some time with them and those within their organisation that would be interested to hear about TGS' plans and to hear if they have any concerns. TGS said they can arrange an online meeting at their convenience to discuss.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	19-05-2023	Letter TO relevant person	TGS posted a registered letter to SRAC advising of TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS enclosed an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided as soon as possible.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	23-05-2023	Phone call TO relevant person	TGS called SRAC to follow up on previous correspondence after receiving a suggestion from another relevant person to contac them. However the number was disconnected.	N	Continuing consultation	* (see note above table)	Continuing consultation
Six Rivers Aboriginal Corporation	23-05-2023	Email TO relevant person	TGS forwarded previous emails sent to SRAC attempting to correspond with them regarding their proposed marine seismic survey attaching an updated information sheet. TGS asked if SRAC has any input about the survey to let them know prior to 26/05/2023 so they can consider the information within the development of their environment plan before submitting to NOPSEMA for their review. TGS also advised there is a public consultation period when the EP will be released to the wider public for review.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Six Rivers Aboriginal Corporation	1-06-2023	Email TO relevant person	TGS emailed SRAC advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked SRAC to advise if they have any queries about their consultation program so they can make sure SRAC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where SRAC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking SRAC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Map presenting survey relative to SA fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	13-05-2022	Email FROM relevant person	The email acknowledges that the MFASA received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will review the survey details. The MFSA also clarified the current Executive Officers contact details and the future contact for administrative services.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Marine Fisheries Association	18-05-2022	Email TO relevant person	TGS/Schlumberger thanked the MFASA for their reply and clarification of contact details. They asked for clarification from the MFASA regarding whether they would represent the views of respective fishers, or if the MFASA would act as a disseminator of the information to the relevant licence holders within the survey area.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	31-05-2022	Email TO relevant person	TGS/Schlumberger invited the stakeholder to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	22-06-2022	Email TO relevant person	TGS/Schlumberger expressed a desire to engage with the stakeholder in a meeting to discuss any questions they may have regarding the potential for the project to interact with fisheries. TGS/Schlumberger asked if the stakeholder could provide some days/times they would be available for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	30-06-2022	Email FROM relevant person	The stakeholder identified that the scope of work for the survey does not affect any of their members due to the fact that only three license holders operate in the area, and that the survey is not intrusive. As such the stakeholder has not raised any objections to the proposal.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South Australian Marine Fisheries Association	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Marine Fisheries Association	19-02-2023	Email FROM relevant person	MFAI responded to previous TGS email providing a response to the TGS survey proposal. The response advised that after considering the amended proposal, the MFA does not believe the area that TGS has proposed for Otway Basin will have impact on the Marine Scale Commercial Fishing access. MFA thanks TGS for consulting them and wished them the best with their venture.	Y - formal response letter	N/A - no impact on marine scale commercial fishing access.	N/A	Consultation closed
South Australian Marine Fisheries Association	20-02-2023	Email TO relevant person	Acknowledged MFA's response email 19/02/2023.	N	N/A	N/A	Consultation closed
South Australian Native Title Services (SANTS)	06-10-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS/Schlumberger explained that from published online resources that Native Title Consent Determination Areas are registered for the following Traditional Owner Groups: • Ngarrindjeri and Others (South Australia); • First Nations of the South East (South Australia); TGS/Schlumberger asked the stakeholder to give advice as to whether the relevant Sea Country Groups are the same as the Native Title groups.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	14-03-2023	Phone call TO relevant person	TGS called SANTS to follow up on email and factsheet sent 15/02/2023 and spoke to a temporary receptionist whom advised everyone was out of the office. The receptionist took TGS's contact details and said someone would ring back later in the day.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	22-03-2023	Email TO relevant person	TGS emailed SANTS to provide them with an updated version of the factsheet which is more concise and provides an explanation of why TGS is wanting to consult with SANTS on their planned project. TGS continued the factsheet explains what a marine survey is, what are the potential effects on the environment, the measures TGS has in place to limit the potential effects and safeguards in place should an unexpected event occur. TGS said they would like to meet SANTS online to share TGS's plans and whether SANTS has any concerns and can arrange an online meeting at their convenience to discuss. TGS closed the email by thanking SANTS and advising they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	27-03-2023	Phone call TO relevant person	TGS called SANTS to follow up on email and factsheet sent on 22/03/2023. SANTS told TGS they had not personally received the factsheet and suggested to send it to them and she would forward to the right person (whom they were unsure of at that stage).	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	27-03-2023	Email TO relevant person	TGS emailed SANTS following a phone call earlier with them where SANTS requested they resend the factsheet providing information about the proposed survey. TGS said they would really like to get some time online with those within SANTS that would be interested to hear about TGS' plans and more importantly for TGS to hear if they have any concerns. TGS advised they would arrange an online meeting at their convenience to discuss. TGS closed the email by thanking SANTS and saying they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	11-04-2023	Email TO relevant person	TGS emailed SANTS to follow up on phone call and email sent 27/03/2023 asking if they would like any additional information. TGS advised they would like to meet SANTS online to discuss the proposed survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss. TGS closed the email by thanking SANTS.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
South Australian Native Title Services (SANTS)	11-04-2023	Email TO relevant person	TGS emailed an alternative contact at SANTS from the contact used in previous correspondence following advice from another Traditional Owner group in regards to the proposed marine seismic survey within Otway Basin. TGS advised they had contacted SANTS with the same information (included email TGS sent on 29/03/2023). TGS explained they would really like to meet online with them to discuss their proposed survey and would like to hear if SANTS have any concerns. TGS advised they can arrange an online meeting at SANTS convenience to discuss, or SANTS can call them direct (details provided). TGS closed the email thanking SANTS.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	17-04-2023	Phone call TO relevant person	TGS called SANTS and spoke to the receptionist who advised they had received the factsheet and tried to transfer to another SANTS representative but they did not answer. The receptionist suggested TGS email the representative direct, providing TGS with the email address.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	17-04-2023	Email TO relevant person	TGS emailed an alternative contact at SANTS as advised by another SANTS representative, providing the updated information sheet. TGS said they would really like to meet online with them and those in their organisation that would be interested in hearing about the proposed marine seismic survey and they would like to hear if they have any concerns. TGS said they could arrange an online meeting at their convenience to discuss. TGS closed the email thanking SANTS.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	17-04-2023	Email FROM relevant person	TGS received an email from the alternative contact within SANTS they emailed earlier in the day, thanking TGS for their email. SANTS advised this is most likely to be of interest only to the First Nations of the South-East (FNSE) within SA and included the FNSE contact within the email who represents FNSE and is best placed to assist with any engagement including identifying interests or concerns.	Y - Updated information sheet	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	20-04-2023	Phone call TO relevant person	TGS called SANTS to follow up on First Nations of the South-East and Burrandies Aboriginal Corporation, but the person TGS needed to speak to and had emailed on 17/04/2023 was not available so TGS left a message for them to call TGS back.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	21-04-2023	Email TO relevant person	TGS emailed SANTS to follow up on email TGS sent 18/04/2023 and phone call and voice mail message left on 20/04/2023. TGS asked SANTS to call or alternatively suggested an online meeting. TGS closed the email thanking SANTS.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	27-04-2023	Phone call TO relevant person	TGS called SANTS to follow up on previous unanswered correspondence and spoke to the SANTS person suggested they speak with and they asked why TGS were consulting them. TGS explained they had been provided their contact details for consultation with First Nations of the South-East (FNSE) and Burrandies Aboriginal Corporation (BAC) regarding their proposed marine seismic survey. TGS provided SANTS an overview of the proposed project and offered a meeting to discuss any concerns they may have with the project. SANTS said they would ask FNSE and BAC if they want to meet or have any concerns.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Native Title Services (SANTS)	22-05-2023	Email TO relevant person	TGS emailed SANTS to follow up on emails and phone calls from 27/04/2023 regarding their proposed marine seismic survey. TGS said that if SANTS has any input about the proposed survey to advise them before 26/05/2023 so the information can be considered within the development of the environment plan before submitting to NOPSEMA soon. TGS closed their email advising SANTS to contact them if they have any questions or would like any futher detail or reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	22-05-2023	Email FROM relevant person	SANTS replied to TGS' email sent earlier that day advising the email was provided and instructions were sought and they will continue to seek instructions.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Native Title Services (SANTS)	22-05-2023	Email TO relevant person	TGS replied to SANT'S email received earlier that day, thanking them.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Recreational Fishing Advisory Council	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Recreational Fishing Advisory Council	17-05-2022	Email FROM relevant person	Email undeliverable to one stakeholder email account.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Maps of the Victorian fisheries that operate in or adjacent to the EP Area - A map of the survey relative to Tasmanian fisheries reporting blocks - A map of the survey relative to SA fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Map of survey relative to South Australian fisheries reporting blocks	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	31-05-2022	Email TO relevant person	TGS/Schlumberger invited the stakeholder to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	02-06-2022	Meeting with relevant person	TGS/Schlumberger/ERM presented an overview of the survey, and of the commercial fishing effort for relevant Commonwealth and State managed fisheries based on available data. The stakeholder suggested TGS/Schlumberger go back to SARDI for better South Australia data, and agreed to follow up, given the data has been provided to them previously. The stakeholder made a general comment that lobster fisheries occur in the periphery of the 3D Active Source Area, but substantial fishing is less likely to occurring depths greater than 100m. TGS / Schlumberger sought the groups' suggestions on best approach for ongoing engagement, whether it be with each organisation separately or if they wanted to nominate a main representative. The stakeholder recommended consultation with the various rock lobster industry organisations and fishers be filtered through the stakeholder at Southern Rock Lobster Ltd.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	03-06-2022	Email FROM relevant person	SARLAC declined an invitation to a stakeholder meeting to be held June 9th 12:30-1:30pm AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	03-06-2022	Email FROM relevant person	SARLAC declined an invitation to a stakeholder meeting to be held June 10th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholders for their attendance and participation in the meeting on June 2nd. TGS/Schlumberger highlighted that the attached 2019 report includes a summary of the proportion of historical catch in each fishery that was overlapped by that survey area, and that the current Otway Basin 3D MSS area is similar. TGS/Schlumberger also noted that stakeholder from SETFIA pointed out there are areas where overlap is expected to be significantly reduced. TGS and Schlumberger informed the stakeholders that they have engaged SETFIA to compile similar information for the Otway Basin 3D MSS.	Y - Summary meeting notes - Copy of the 2019 Schlumberger Otway 2D Seismic Survey report prepared by SETFIA	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	23-06-2022	Email TO relevant person	TGS noted that at the first stakeholder briefing session on the 6th June, it was indicated that the Southern Rock lobster Ltd would be the central point of contact for consultation with all of the State rock lobster fisheries. TGS acknowledged that the survey area does not overlap areas of significant rock lobster fishing, but welcomed an additional meeting to answer any questions regarding impacts to lobster of giant crab fishing from the project. TGS asked if SARLAC could communicate a time when the meeting could be held.	N	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	23-06-2022	Email FROM relevant person	South Australian Rock Lobster Advisory Council declined an invitation to a stakeholder meeting scheduled for June 29th 9:00-10:00am AWST.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	30-06-2022	Email FROM relevant person	South Australian Rock Lobster Advisory Council declined an invitation to a stakeholder meeting scheduled for July 5th 8:30-9:30am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
South Australian Rock Lobster Advisory Council Inc.	19-05-2023	Phone call TO relevant person	SLR called SARLAC to discuss TGS' marine seismic survey within the Otway Basin but there was no answer. SLR left a message for SARLAC advising they are working with TGS on their proposed survey and assisting them with the consultation process. SLR also advised there has been a reduction in the Operation Area, removing the survey from South Australian waters. SLR asked for SARLAC to call them back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	19-05-2023	Email FROM relevant person	The Southern Rock Lobster Ltd replied to TGS' email sent earlier that day and confirmed the SA Rock Lobster fishery has two peak bodies.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South Australian Rock Lobster Advisory Council Inc.	19-05-2023	Email TO relevant person	TGS emailed the Southern Rock Lobster Ltd representative to ask if they also represent SARLF as they hadn't heard anything back from them regarding their proposed marine seismic survey within the Otway Basin.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
South Australian Rock Lobster Advisory Council Inc.	22-05-2023	Phone call TO relevant person	SLR called SARLAC to follow up on phone call, message and email from 19/05/2023 regarding TGS' marine seismic survey within the Otway Basin but there was no answer. SLR left a message asking if SARLAC was available to meet to discuss the survey or SARLAC could reply to the email sent 19/05/2023 or call SLR or TGS to discuss further.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Professional Fisherman's Association	19-05-2023	Phone call TO relevant person	SLR called SEPFA to discuss TGS' marine seismic survey within the Otway Basin but there was no answer. SLR left a message for SEPFA advising they are working with TGS on their proposed survey and assisting them with the consultation process. SLR also advised there has been a reduction in the Operation Area, removing the survey from South Australian waters. SLR asked for SEPFA to call them back.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Professional Fisherman's Association	22-05-2023	Phone call TO relevant person	SLR called SEPFA to follow up on phone call, message and email from 19/05/2023 regarding TGS' marine seismic survey within the Otway Basin but there was no answer. SLR left a message asking if SEPFA was available to meet to discuss the survey or SEPFA could reply to the email sent 19/05/2023 or call SLR or TGS to discuss further.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corpora	29-03-2023	Email TO relevant person	TGS emailed SETAC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided by 05/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	4-04-2023	Phone call TO relevant person	TGS called SETAC to follow up on their email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin and spoke to reception advising they had called the [alternative location]. The reception asked what email address the information had been sent to and TGS provided information. They said they would find out who to forward the information to.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	11-04-2023	Phone call TO relevant person	TGS called an alternative contact phone number for SETAC to follow up on their phone call from 04/04/2023 and email sent 29/03/2023 regarding their proposed marine seismic survey within the Otway Basin, however there was no answer. TGS left a message to call back.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	11-04-2023	Email TO relevant person	TGS emailed SETAC to follow up on email sent 29/03/2023 (copy of email included) regarding their proposed marine seismic survey within the Otway Basin. TGS advised they would like to meet SETAC online to discuss the proposed survey and hear any concerns they may have. TGS suggested they could arrange an online meeting at their convenience to discuss, or they can call them direct (mobile contact details provided). TGS closed the email by thanking SETAC.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	20-04-2023	Phone call TO relevant person	TGS called SETAC to follow up on their phone call and email sent 11/04/2023. The receptionist advised they had received the email and forwarded to another SETAC representative. The receptionist confirmed SETAC is a health care provider but the SETAC representative (Health Care Manager) was also from the Weetapoona Aboriginal Corporation who looks after the environment. The receptionist took TGS' phone number to call back.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	28-04-2023	Email TO relevant person	TGS emailed SETAC following phone call earlier that day. TGS mentioned they will be in Hobart next week and would welcome the opportunity to give a project overview and to hear if SETAC or anyone else in their organisation has any concerns or questions about the proposed Otway offshore seismic survey. TGS suggested any time Friday or Thursday afternoon would work. TGS closed the email stating they look forward to meeting with them next week.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	1-05-2023	Email TO relevant person	TGS replied to SETAC's email received earlier that day thanking them for their reply. TGS said they are engaging other groups as well but would like to engage with all groups to ensure TGS understands any concerns the different groups.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	1-05-2023	Email FROM relevant person	SETAC replied to TGS' email sent 28/04/2023 advising TGS that looking at the map, SETAC think it would be best to engage with Australia mainland Aboriginal organisations as it is much closer to them than SETAC and asked TGS what their thoughts were.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	3-05-2023	Email TO relevant person	TGS replied to SETAC's email received earlier that day thanking them and advised they can arrange a meeting online next week.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	3-05-2023	Email FROM relevant person	SETAC replied to TGS' email sent 01/05/2023 advising they had sent an email to see if anyone is available on Friday as they are all busy on Thursday and would advise TGS soon.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS emailed SETAC asking if they would be available for an online meeting the current week.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS replied to SETAC's email received ealier that day and suggested an online meeting date and time of 11/05/2023 at 11:00 am.	N	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS emailed SETAC seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from SETAC to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked SETAC to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
South East Tasmanian Aboriginal Corporation	9-05-2023	Email FROM relevant person	SETAC replied to TGS' email sent earlier that day enquiring about an online meeting. SETAC replied yes they would be available for an online meeting that week and asked TGS to advise when and they will send an invite to their cultural committee.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Tasmanian Aboriginal Corporation	11-05-2023	Meeting with relevant person	TGS, SLB and SLR met with WAC/SETAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with WAC/SETAC: - Fuel release and response process; - Reason for survey - to provide data to oil and gas companies, not a government initiative. - Impacts to marine life, cultural sites (petroglyph sites), heritage sites (Tasmanian Wilderness Heritage area) and fishing trap areas. - TGS part of the Energeo Alliance Ghost Net and Marine Debris Removal Iniative. - Socio-economic benefits of the project - employment opportunities etc. - Oil and gas exploration and drilling is not in the scope of this project, just data acquisition. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Purpose of the EP: **Section 1.2** Fuel release and response process: **Section 8.3.6** specififes the Control Measures to ensure the risks of accidential hydrocarbon release is ALARP, **Section 8.4** described the Hydrocarbon Spill Response, **Section 10.10** (Oil Pollution Emergency Plan) describes the response procedures for any accidental hydrocarbon release. The Operational and Scientific Monitoring PLan (OSMP) specifies monitoring response protocols, if triggered. Impacts to marine life: various sensitive receptors are discussed in **Section 7.2** (for acoustic impacts), **Section 7.3** (routine permissible waste discharge), **Section 7.4** (atmospheric emissions), **Section 7.5** (artificial light emissions), **Section 8.1** (IMS), **Section 8.2** (streamer loss), **Section 8.3** (vessel collision and hydrocarbon spill), and **Section 8.5** (accidental release of hazardous and non-hazardous material). Impacts to cultural and heritage sites: Impacts to culture and heritage, as well as socio-economic imapcts are disscussed in detail in **Section 7.1.3** (Physical presence), **Section 7.2.3** (Acoustic imapcts), **Section 8.1.3** (Unplanned activities), **Section 8.3.4** (hydrocarbon spill) Impact to important species: **Section 7.2.2** (acoustic impacts), **Section 7.2.3** (routine permissible waste discharges), **Section 7.4.2** (atmospheric emissions), **Section 7.5.2** (artificial light emissions), **Section 8.1.2** (IMS), **Section 8.2.2** (streamer loss), **Section 8.3.3** (vessel collision and hydrocarbon spill), **Section 8.5.2** (accidental release of hazardous and non-hazardous materials). Ongoing consultation with WAC/SETAC will be undertaken in accordance with the methods set out in Section 5 to ensure WAC/SETAC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
South East Tasmanian Aboriginal Corporation	9-06-2023	Email TO relevant person	TGS emailed SETAC to provide them with a copy of the meeting minutes and presentation for their review and record. TGS asked SETAC to advise of any changes and provided the following information as discussed during the meeting: - contact for Aboriginal Heritage Tasmania; - information about the Energeo Alliance - Ghost net and marine debris removal initiative, including information about handling entangled animals (attached); and - employment opportunities (marine fauna observer possibility), asking SETAC to advise if there would be interest so they can discuss further. - TGS thanked SETAC for their time and information and advised they have noted their concerns and queries which will be incorporated within their enviornmental and survey planning and environmental plan. TGS closed by advising they will keep them updated as things progress and get the impact summaries as soon as they can but asked them to get in touch if they have any amendments or queries.	Y - Meeting minutes, copy of presentation and IAGC guidance for handling entangled animals.	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	12-05-2022	Email FROM relevant person	Email undeliverable to one stakeholder email account. Note there was a correction of this address to and the email was re-sent.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	13-05-2022	Email TO relevant person	TGS state they are contacting SETFIA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of the Commonwealth fisheries	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	16-05-2022	Email FROM relevant person	The email acknowledges that the SETFIA received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS. The stakeholder noted the similarity of the project to a previous MSS proposal (Otway Regional 2D Survey), and that the current proposal used ABARES charts of fishing catch without actual catch and revenue being quantified. They noted that the use of ABARES only does not assist them in understanding actual impact on the GHaT and CTS. There were 2 questions raised: 1. How do the polygons from the 2019/20 Otway Regional 2D survey and the current survey relate. 2. What is the GHaT and CTS catch and revenue taken from the 2022 (current) surveys polygon.	Y - 2 images were included in the email	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
South East Trawl Fishing Industry Association (SETFIA)	19-05-2022	Email FROM relevant person	SETFIA suggest a separate report is not necessary rather an update to Table 1, this can be further discussed with SETFIA.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	19-05-2022	Email TO relevant person	TGS/Schlumberger thanked SETFIA for their quick reply. It was communicated that there are differences between the current survey and the Otway Regional 2D area, particularly along the northern margin, and that currently TGS has no catch and revenue data for the current survey. It was noted that depending on the resolution of SETFIAs data, there may be some differences from the last EP, particularly if the current survey area doesn't encroach as far into the fisheries. TGS/Schlumberger enquired as to whether SETFIA could prepare a similar report regarding commercial fishing data, and if so, could a call be set up involving the relevant parties (TGS, Schlumberger and ERM).	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	19-05-2022	Email TO relevant person	TGS/Schlumberger requested the stakeholder advise them of their availability for a call via teams on Monday 23/05/2022.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	19-05-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	19-05-2022	Email FROM relevant person	SETFIA agreed to a teams call on the morning of 23 May 2022 (Melbourne time).	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	23-05-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Active Source Area - EP Area (Total 15 attachments)	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	30-05-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal for services	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited SETFIA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	02-06-2022	Meeting with relevant person	TGS/Schlumberger/ERM presented an overview of the survey, and of the commercial fishing effort for relevant Commonwealth and State managed fisheries based on available data. The stakeholder clarified in regards to the Commonwealth trawl sector that there is a deep water closure line which follows the 700 m contour in some areas, but the 1,000m contour in others, particularly off west coast of Tasmania. The stakeholder noted that the fishing data presented during the meeting is based on course resolution data (e.g. 60 NM blocks in the case of Commonwealth fisheries) so generally over-represented the area of fishing effort in some cases. They also noted that the polygon significantly reduced overlap with many fisheries compared with Schlumberger's 2D seismic polygon which SETFIA consulted on back in 2019 (potentially as much as 80% in some cases). The stakeholder encouraged TGS and Schlumberger to share the report that SETFIA had prepared for Schlumberger in 2019 with all attendees so that they can see the reduction in overlap. SETFIA was pleased to see impacts to shark and trawl sectors have been significantly reduced, and noted that some Scale fish Hook Sector effort may also be relevant, as well as the various State giant crab and rock lobster fisheries. SETFIA asked TGS/Schlumberger if compensation would be available if any fishers suffer a loss due to displacement and reduced catch. TGS confirmed that their priority is to first work with the fishing industry to reduce the potential for impacts. The stakeholder stated the industry will be looking for a clear commitment to compensate for reduced catch. TGS confirmed that a compensation policy will be in place but they are currently looking at the specifics of the policy and how it will be implemented. TGS / Schlumberger sought the groups' suggestions on best approach for ongoing engagement, whether it be with each organisation separately or if they wanted to nominate a main representative. SETFIA referred TGS/Schlumberger to the SETFIA 2019 Report for appropriate contacts for industry organisations, as well as individuals where a fishery did not have its own industry organisation.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	3-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal for services with comments from TGS	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	03-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Updated map showing new boundaries.	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	03-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	03-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Final executed proposal signed by TGS/Schlumberger	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	03-06-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal with accepted changes	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	03-06-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Final executed proposal	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	6-06-2022	Email FROM relevant person	Request for shapefiles of the operational area (larger) and acquisition area (slightly smaller).	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	06-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Shapefiles	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	06-06-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	06-06-2022	Email FROM relevant person	SETFIA declined an invitation to a stakeholder meeting to be held June 10th 9:00-10:00am AWST under the assumption that it was a repeat of the June 2nd meeting.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	17-06-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholders for their attendance and participation in the meeting on June 2nd. TGS/Schlumberger highlighted that the attached 2019 report includes a summary of the proportion of historical catch in each fishery that was overlapped by that survey area, and that the current Otway Basin 3D MSS area is similar. TGS/Schlumberger also noted that the stakeholder from SETFIA pointed out there are areas where overlap is expected to be significantly reduced. TGS and Schlumberger informed the stakeholders that they have engaged SETFIA to compile similar information for the Otway Basin 3D MSS.	Y - Summary meeting notes - Copy of the 2019 Schlumberger Otway 2D Seismic Survey report prepared by SETFIA	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	23-06-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	24-06-2022	Email TO relevant person	Requesting a catch up to discuss EP submission timeframes and at what stage TGS can incorporate findings from SETFIAs report.	N	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	27-06-2022	Email FROM relevant person	SETFIA declined an invitation to a stakeholder meeting scheduled for June 29th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	01-07-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	1-07-2022	Email TO relevant person	Follow up on earlier conversation to advise that, due to timeframes, SETFIA' SLB 2D report from 2019 will be submitted in the interim whilst awaiting their new report.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	02-07-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	25-07-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	25-07-2022	Email FROM relevant person	SETFIA confirming they have data from Victoria and AFMA, data yet to be obtained from SA and Tasmania.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	03-08-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	03-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	04-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	02-09-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - PDF and Word document fisheries data report	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email TO relevant person	Clarifying comments against a Table entry in a report.	N	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - PDF and Word document fisheries data report with comments	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email TO relevant person	TGS thank SETFIA for draft report and attach it with comments from TGS.	Y- Fishing data report with tracked comments from TGS	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	06-09-2022	Email FROM relevant person	SETFIA noting minor comments/errors in report.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Email TO relevant person	Reply to email from SETFIA dated 6-Sept-23 2:01pm, acknowledging discussions had regarding reports comments.	N	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Updated area coordinates and Active Source Area	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Meeting with relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	09-09-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - PDF and Word document fisheries data report finalised post comments	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	10-09-2022	Email TO relevant person	Commentary on the EP boundaries used in SETFIAs report.	Y - XLS boundary coordinates. JPG EP area	N/A	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	10-09-2022	Email TO relevant person	Email thanking SETFIA for final version of report.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	12-09-2022	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	12-09-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Version 3.2 FINAL-FINAL of fisheries data report	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	17-02-2023	Phone call TO relevant person	Discussed the revision to the Environment Plan and the potential to get the Otway fishing report updated. SETFIA advised they have been busy with all the wind farm consultation with over a dozen requests and requested TGS send through a request and they will look at it next week.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	17-02-2023	Email TO relevant person	TGS emailed following previous phone call with SETFIA earlier that day to request a cost and timing for revising the commercial fishing report similar to what SETFIA provided last year with the updated EP area, noting the updated EP area excluded SA. TGS provided the updated map and shapefiles.	Y - Updated map and shapefiles	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	27-02-2023	Phone call TO relevant person	TGS called SETFIA but there was no answer. TGS left voice message to return call.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	27-02-2023	Text message FROM relevant person	SETFIA texted TGS responded to voice message left earlier in the day advising they were very busy and to call back later in the week. SETFIA apologised for putting TGS off.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	13-03-2023	Phone call TO relevant person	TGS called SETFIA but there was no answer. TGS left voice message to return call.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	23-03-2023	Phone call TO relevant person	TGS called SETFIA but there was no answer. TGS left voice message to return call regarding the Otway Seismic Survey.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	30-03-2023	Email FROM relevant person	SETFIA emailed TGS apologising for being hard to find explaining their heavy workload including a variety of MSS companies chasing them. SETFIA attached a policy document aimed at MSS proponents that SSIA (Shark Fishery) and SETFIA (trawl) have drafted in order to assist with the number of approaches being made. SETFIA closed the email by suggesting they have an online meeting. The SETFIA submission proposed the following six steps to effective consultation and planning of MSSs: 1. Proponents to complete a data project to guide their consultation. 2. Proponents should focus engagement on fisheries working in and around the area of interest. 3. SSIA and SETFIA can only assist if proponents agree to cover reasonable costs. 4. Proponents acknowledge there is a real potential for impacts on fishing and try to adjust the MSS footprint or timing to reduce impacts. 5. Compensation must be paid where mitigation is not possible and fishing industry must move elsewhere and catches decline. 6. SETFIA offers a SMS/text system to contact fishers in different regions for notifications and updates. Refer to Appendix H for a copy of the detailed submission.	Y - Formal submission policy statement	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Consultaion with commercial fisheries industry bodies is an ongoing process for the duration of the development of the EP, and during the lifetime of the Seismic Survey. This is recognised via a suite of control measures, notification procedures, and development of an agreed commercial fisheries compensation protocol, addressed in teh following sections of the EP: Effects to commercial fishing industry: Section 7.1.3.1 (impacts of the physical presence of the seismic survey vessels), Section 7.2.3.1 (imapcts of acoustic disturbacne on fisheries), Section 8.2.3 (imapct of streamer loss), Section 8.3.4.1 (hydrocarbon spill), and Table 84 includes control measures for adressing commercial fishers compensation in accordance with agreed protocols. Spatial avoidance of fishing grounds: Table 84 lists the control measure for compensation to fishers for any claims received in accordance with the agreed compensation protocol. Cumulative impacts on stock: Table 84 lists control measures to require a SIMOPS plan, which inlcudes the implementation of a 40 km spatial separation between Seismic Vessels. Section 9 sets out the approach to manageing Cumulative Impacts. Outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP. Ongoing consultation with SETFIA will be undertaken in accordance with the methods set out in **Section 5** to ensure SETFIA have had both sufficient information, and sufficient time to engage in the consultation programme.	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	30-03-2023	Email TO relevant person	TGS responded to SETFIA's email dated 30/03/2023 thanking them for their submission and agreeing to have an online meeting. TGS asked SETFIA to let them know when is convenient next week and they will organise. Two other emails followed confirming a date and time.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	30-03-2023	Email FROM relevant person	SETFIA emailed TGS and SLR a meeting invite for 05/04/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	5-04-2023	Meeting with relevant person	TGS, SLB and SLR met with SETFIA to discuss their policy statement received 30/03/2023 and ongoing consultation with Commonwealth commercial fishers. SETFIA explained their overwhelming workload and apologised for the delay with their response. SETFIA confirmed they represent the Commonwealth Trawl Fishery and the Southern Shark Industry Alliance (gillnet, hook and trap fisheries). The meeting concluded with a plan for SETFIA to submit a proposal to TGS/SLB for works to provide data on relevant fisheries. Once TGS approve the proposal, SETFIA will request the data and prepare information for TGS. However SETFIA explained this data is not likely to be available until June 2023. The proposal included the ability to liaise with relevant fishers via a text message. Refer to Appendix I for a copy of the full meeting minutes.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	6-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal for services	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	13-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal for services	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	13-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	14-04-2023	Email TO relevant person	TGS provided SETFIA with minutes from their meeting held 05/04/2023.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	16-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Updated proposal for services	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	16-04-2023	Email FROM relevant person	SETFIA replied to meeting minutes sent to them for review on 14/04/2023 with suggested changes.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	17-04-2023	Email TO relevant person	TGS replied to SETFIA's email received 16/04/2023 providing amended meeting minutes incorporating changes suggested in their email.	Y - Updated meeting minutes	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
South East Trawl Fishing Industry Association (SETFIA)	17-04-2023	Email TO relevant person	TGS replied to SETFIA's emailed received 16/04/2023 providing amended proposal, thanking them and advising they will revert soon.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	17-04-2023	Email FROM relevant person	SETFIA replied to TGS' email sent earlier that day, thanking TGS and advising they appreciate it.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	18-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Proposal for services contract	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	19-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Executed proposal for services contract	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	19-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	21-04-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	21-04-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	5-05-2023	Email FROM relevant person	SETFIA emailed TGS to advise their commercial fishing data request had been submitted to relevant agencies.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	9-05-2023	Email TO relevant person	TGS replied to SETFIA's email received 05/05/2023 thanking them.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Phone call TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email TO relevant person	TGS replied to SETFIA's email received and phone call made earlier that day. TGS provided SETFIA with TGS' latest information sheet for commercial fishers.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service) and commissioning of report. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email TO relevant person	TGS replied to SETFIA's email received earlier that day and confirmed they had been in contact with the SA Marine Fishers Assn and the South Eastern Professional Fishermans Assn.	N	N/A	* (see note above table)	Continuing consultation.
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email FROM relevant person	SETFIA emailed TGS to advise that Victoria, AFMA and SA (slower) were making progress on their data request. SETFIA suggested that once TGS has expected dates, they implement the SMS program.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email FROM relevant person	SETFIA replied to TGS' email sent earlier that day regarding a draft text message to notify commercial fishers of TGS proposed marine seismic survey. SETFIA provided draft text for TGS to review. SETFIA also asked TGS if they have spoken to SIV, TSIC and SA associations.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	11-05-2023	Email FROM relevant person	SETFIA replied to TGS's email sent earlier that day suggesting contact details for the SA Marine Fishers Assn and South Eastern Professional Fishermans Assn.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	16-05-2023	Phone call TO relevant person	TGS called SETFIA to advise they were about to contact the commercial fishers individually as part of their consultation requirements. SETFIA asked TGS to not send any information to fishers and questioned where the fishers' contact information had been obtained. TGS advised that AFMA had provided the contact details.	N	Continuing consultation	* (see note above table)	Continuing consultation
South East Trawl Fishing Industry Association (SETFIA)	16-05-2023	Phone call FROM relevant person	SETFIA called TGS back regarding their earlier phone call about contacting commercial fishers direct following a phone call with AFMA. SETFIA advised that AFMA stated they would not have provided the contact details. TGS confirmed they would pause on contacting the commercial fishers direct until the matter was resolved.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Gippsland Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Gippsland Shire Council	16-02-2023	Email FROM relevant person	Automated email reply advising a member of council's staff would get back to TGS as soon as possible.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Gippsland Shire Council	24-04-2023	Email TO relevant person	TGS emailed SGSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SGSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
South Gippsland Shire Council	24-04-2023	Email FROM relevant person	Automated response to TGS' email sent earlier that day acknowledging email and advising SGSC will response within 10 business days.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Gippsland Shire Council	10-05-2023	Phone call TO relevant person	TGS called SGSC to follow up on email TGS sent on 24/04/2023 regarding their proposed marine seismic survey within the Otway Basin, to clarify the environment that may be affected (EMBA). SGCS asked to be removed from the consultation list.	N	Continuing consultation	* (see note above table)	Continuing consultation
South Gippsland Shire Council	11-05-2023	Email FROM relevant person	SGSC replied to TGS' email sent 24/04/2023 advising that considering the location of the activity and the information provided, SGSC do no have any feedback to share with TGS at this point in time. SGSC said they appreciate the opportunity to provide comment and for now welcome ongoing updates and information on the project.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
South Gippsland Shire Council	19-05-2023	Email FROM relevant person	Automated response to TGS' email sent earlier that day acknowledging email and advising SGSC will response within 10 business days.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Coast Charters (King Island Dive Adventure)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Southern Coast Charters (King Island Dive Adventure)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Coast Charters (King Island Dive Adventure)	24-04-2023	Email TO relevant person	TGS emailed SCC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SCC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Coast Charters (King Island Dive Adventure)	26-04-2023	Email FROM relevant person	SCC emailed TGS and advised all is ok their end with the survey.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Coast Charters (King Island Dive Adventure)	27-04-2023	Email FROM relevant person	SCC replied to TGS' email sent earlier that day advising they are ok to remain on the survey consultation list.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Southern Coast Charters (King Island Dive Adventure)	27-04-2023	Email TO relevant person	TGS replied to SCC's email received yesterday thanking them for their reply and letting them know they are ok with the proposed survey. TGS asked SCC if they wanted to be kept on the consultation list so they can keep updated with the survey progress or would they prefer to be removed [from the consultation list]. TGS closed the email advising SCC can always contact TGS if any queries arise.	N	N/A	* (see note above table)	Continuing consultation.
Southern Coast Charters (King Island Dive Adventure)	28-04-2023	Email TO relevant person	TGS replied to SCC's email received yesterday advising SCC would like to remain on the survey consultation list.	N	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	19-08-2022	Email FROM relevant person	SOPEC emailed TGS to provide a letter of request to be consulted by Traditional Custodians of Sea Country along the SW coast of Victoria encompassing Sea Country for Gunditjmara, Keerray Woorroong, Gadubanud and Wathaurong. SOPEC concluded their email stating they anticipate a response at TGS' earliest convenience.	Y - Letter of Request to be Consulted	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	19-08-2022	Email FROM relevant person	The stakeholder attached a letter with the request to have full project information shared, and protections to be negotiated across Gunditjmara Country for the Southern Right Whale.	Y - Letter of Request to be Consulted	Stakeholder has raised an objection, claim or concern. The stakeholder opposes the proposed seismic survey and requested a meeting between TGS/SLB and SOPEC members.	* (see note above table)	Continuing consultation
Southern Ocean Protection Embassy Collective Hissing Swan Arts	24-08-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for the correspondence and information provided. TGS/Schlumberger provided some dates and times for a meeting to be held.	N	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	08-10-2022	Email FROM relevant person	The stakeholder thanked TGS/Schlumberger for their reply, and explained that the slow response was a result of consulting with Elders and the relevant communities. The stakeholder detailed that they will reach out in the coming weeks with clearer dates and times for a meeting.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	10-10-2022	Email TO relevant person	TGS/SLB thanked the stakeholder for their response.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Southern Ocean Protection Embassy Collective Hissing Swan Arts	4-01-2023	Email TO relevant person	TGS reconnected with FNLRS given it had been a while since last communicated to see if they were available for a meeting on the EP.	N	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	13-02-2023	Email TO relevant person	TGS Reconnected to advise of changes to survey (area size and contact details) and provide updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	15-02-2023	Email TO relevant person	TGS emailed SOPEC to ensure they had received the previous email from TGS sent 13/02/2023 as technical error may have prevented them from replying. TGS asked for all comments to be provided by Thursday 16/03/2023.	N	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	27-02-2023	Phone call TO relevant person	TGS called SOPEC to follow up on previous correspondence to discuss the survey and their previous submission (dated 19/08/2022) however there was no answer. TGS sent a text message to request a meeting at their convenience.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Ocean Protection Embassy Collective Hissing Swan Arts	27-02-2023	Text message TO relevant person	TGS messaged SOPEC to advise they would welcome the opportunity to meet with them and asked them to please let them know when convenient.	N	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	24-04-2023	Email TO relevant person	TGS emailed SOPEC to provide an update on their proposed marine seismic survey within the Otway Basin. TGS thanked SOPEC for their patience with TGS' response to their submission [received 19/08/2022]. TGS advised SOPEC they are still planning their survey incorporating feedback from their stakeholders and have enough information to discuss SOPEC's comments and explain some of the measures TGS will be implementing to avoid and mitigate impacts to the marine environment, including protection for the southern right whales. TGS commented they need to ensure they fully understand SOPEC's concerns and a meeting would provide them the opportunity to discuss them. TGS attached the updated information sheet to provide some of the changes they have been working on. TGS asked if SOPEC would be available to meet online or for a phone call (contact details provided to SOPEC).	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Ocean Protection Embassy Collective Hissing Swan Arts	9-06-2023	Email TO relevant person	TGS emailed SOPEC thanking them for their submission (Aug 2022) regarding their proposed seismic survey and to provide an update on the progress with their survey. TGS advised they are about to submit their environment plan (EP) to NOPSEMA and once accepted as completd will be released for public consultation. SOPEC will have an opportunity to review the draft EP and provide feedback before TGS update the EP and resubmit to NOPSEMA for their overall assessment. However TGS expressed their desire to meet with SOPEC to discuss the information they have shared particularly their deeply troubling cultural and legal concerns. TGS added they would like SOPEC to know they acknowledge their birthrights to sea country and their opposition to industrialisation and TGS respects that. TGS suggested they could meet to introduce themselves and the proposed survey and discuss their concerns and strong cultural alliance with the sea country. TGS would like to better understand the values and sensitivities of their traditional owner groups to TGS can ensure they are considered, respected and protected during survey planning and operations. TGS added they can also explain the EP process and the work TGS has been doing to understand the environmental sensitivities in the area and control measures TGS has develoed to avoid harming marine fauna, particularly the sacred species SOPEC has mentioned. TGS also provided information to help SOPEC provide feedback on the proposed survey, explaining SOPEC's rights and TGS' obligations through the consultation process. TGS asked SOPEC to advise if they would like to meet or would like more information or alternatively if they would no longer like to engage on the survey and would prefer to be removed from their consultation program and they will update their records.	Y - Updated information sheet and NOPSEMA guidance for provided feedback	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Maps of the Victorian fisheries that operate in or adjacent to the EP Area - A map of the survey relative to Tasmanian fisheries reporting blocks - A map of the survey relative to SA fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	31-05-2022	Email TO relevant person	TGS/Schlumberger invited the stakeholder to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	23-06-2022	Email TO relevant person	TGS/Schlumberger noted that at the first stakeholder briefing session on the 6th June, it was indicated that the Southern Rock lobster Ltd would be the central point of contact for consultation with all of the State rock lobster fisheries. TGS/Schlumberger acknowledged that the survey area does not overlap areas of significant rock lobster fishing, but welcomed an additional meeting to answer any questions regarding impacts to lobster of giant crab fishing from the project. TGS/Schlumberger asked if SRL could communicate a time when the meeting could be held.	N	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	27-06-2022	Email FROM relevant person	The stakeholder advised TGS/Schlumberger that they are available for a meeting during the week of 4th July (besides Friday 8th July). They proposed 10:30am Tuesday Eastern time for the meeting.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	29-06-2022	Email FROM relevant person	The stakeholder accepted a meeting on Tuesday 5th July 8:30-9:30 AWST with TGS/Schlumberger.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	05-07-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for their attendance at the meeting on July 5th and explained that the meeting notes would be sent through once finalised.	Y - Meeting presentation	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	05-07-2022	Meeting with relevant person	Stakeholder requested that information discussed not be publically disclosed except the following key points to represent concerns and the position of some of SRL's members: - Concerns regarding impacts to lobsters based on recent research; - Concerns regarding impacts to lobster larvae/puerulus based on recent research; - Request that all areas of historical rock lobster fishing effort be excluded from the survey.	N	Stakeholder has raised an objection, claim or concern. The objection, claim or concern is addressed in the EP. Impacts to rock lobster have been assessed in the EP. No discernible impacts to stock given that the 3D Active Source Area avoids the continental shelf (core rock lobster distribution) and acquisition on the shelf is limited to a few hours/single 2D tie line. Limited or no effects to deep water white lobster on the continental slope given water depths and vertical sound propagation losses. Impacts to larvae and recruitment of rock lobster are assessed in the EP. The magnitude and extent of effects from a seismic survey (transient point source) are expected to be negligible in the context of natural mortality and variability at a regional scale. Request to exclude all areas of historical fishing effort has been considered, but not adopted given that the Active Source Area already has very limited overlap with rock lobster habitat and fishing effort. Overlap is mainly with infrequent fishing effort for deep water white lobster. Given low frequency of fishing in deep water, the potential for interaction is unlikely. Note that fishing effort data is available in coarse resolution 10 nm or 30 nm blocks depending upon State data and it is not possible to accurately determine the location of fishing effort. However, the 3D Active Source Area is in water depths greater than 510 m (shallowest point) and generally deeper than 600 or even 700 m, therefore, even deep water lobster is expected to be avoided. While exclusion of all fished blocks by rock lobster fishery has not been adopted, the following controls have been adopted in the EP and should prevent/limit impacts to the fisheries: - Exclusion of acquisition in water depths <1,000m south of the 2D Tie Line Extension Area. This was implemented primarily for giant crab but indirectly benefits Tasmanian Rock Lobster and part of the Victorian Rock Lobster Fishery. - When acquiring 3D data at eh northern and eastern margins of the 3D Active Source Area, the seismic vessel will make line turn towards deep water (i.e. away from areas of fishing effort). Therefore, potential interaction with rock lobster fishers on the continental shelf is limited only to the single 2D tie line in the 2D Tie Line Extension Area, or in the unlikely event that the seismic vessel (at the decision of the Vessel Master) has to make an unforeseen movement outside of the Active Source Area into the surrounding EP Area.	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	07-10-2022	Email TO relevant person	TGS/Schlumberger updates the stakeholder on the progress of the EP, and listed aspects of the potential survey that would assist in avoiding disturbance to rock lobster fishers and habitat.	Y - Meeting notes	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	07-10-2022	Email FROM relevant person	The stakeholder explained that they are out of the office until October 10, and gave alternative contact details.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	7-10-2022	Email FROM relevant person	Automatic reply for out of office, returning on the 10/10/2022.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	13-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	11-04-2023	Email TO relevant person	TGS emailed SRLL to arrange an online meeting to discuss their proposed marine seismic survey, acknowledging their current high level of information requests. TGS said they consider SRLL's input valuable and want to ensure they are addressing any concerns they may have. TGS closed the email asking them to advise a suitable date and time for an online meeting and they will arrange. TGS attached the updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	11-04-2023	Email TO relevant person	TGS replied to SRLL's email sent earlier that day and suggested 26/04/2023 at 13:00 hrs for a meeting and if suitable would send a meeting request.	N	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	11-04-2023	Email FROM relevant person	SRLL replied to TGS' email sent earlier that day thanking them for getting in touch and advising they have availability from the week beginning 24/04/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Southern Rock Lobster Limited	12-04-2023	Email TO relevant person	TGS emailed meeting invite to SRLL for 26/04/2023 at 3:00 pm and attached the minutes from the last meeting held 07/05/2022.	Y - Last meeting minutes dated 07/05/2022	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	12-04-2023	Email FROM relevant person	SRLL replied to TGS' email sent yesterday confirming their suggested meeting date and time (26/04/2023 at 1 pm) sounds good.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	13-04-2023	Email FROM relevant person	SRLL accepted the meeting invite that TGS emailed 12/04/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation
Southern Rock Lobster Limited	26-04-2023	Meeting with relevant person	TGS, SLB and SLR met with SRLL to provide information about the proposed survey, to identify any potential impacts to SRLL's functions, interests or activities and discuss any concerns SRLL has with the proposed survey. The meeting's key comments included: - SRLL represents five rock lobster organisations (SA, northern, southern, Victorian and Tasmanian) with mixed views on seismic surveying from not interested to strongly opposed. - SRLL believes the research suggests seismic only likely to be having mild impacts on fisheries. - Strong opposition around Apollo Bay and keen to understand if something occurring within fishery or an individual's view. - Queried impacts assessment and SLR explained is based on assessing impacts to existing environment and sensitivities using basic risk assessment processm a consequence x likelihood assessment. - Likelihood of noise from air guns reaching shore line (60 km away). - Underwater acoustic modelling. - SRLL would like to see the commercial fisheries compensation protocol. - Peak lobaster fishing periods. - Can SLR provide any information to explain concern around Apollo Bay. - Catch rates have increased in nearly every state. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are addressed in the following sections: Environmental plan development process and impact assessment: **Section 2** (environmental management framework), **Section 6** (impact assessment and risk assessment methodology) Control measures for managing adverse effects to commercial fisheries: Consultaion with commercial fisheries industry bodies is an ongoing process for the duration of the development of the EP, and during the lifetime of the Seismic Survey. This is recognised via a suite of control measures (**Table 84**), notification procedures (**Table 84, Table 148**), and development of an agreed commercial fisheries compensation protocol (as per **Table 84** control measures). Underwater noise modelling / acoustic disturbance: **Section 7.2.1.2** (underwater noise modelling), **Section 7.2.3.1** (imapcts of underwater noise on commercial fishers). Remaining concerns, including concerns regarding Apollo Bay (and relevant persons) will be subject to ongoing consultation. TGS will continue to consult with SRLL and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Southern Rock Lobster Limited	15-05-2023	Email TO relevant person	TGS emailed SRLL a copy of the minutes from the meeting held on 26/04/2023 for their review and record. TGS advised they haven't been able to identify any site-specific scientific reasons for the elevated interest in Apollo Bay. TGS also advised there is information within the attached acoustic modelling report to support the very low likelihood of being able to hear the survey 60 km away from the coast. TGS closed the email by thanking SRLL for meeting with TGS and sharing information and asked SRLL to get in touch if they need more information or have any queries. TGS added they will keep SRLL updated with their progress.	Y - Meeting minutes, Draft Commercial Fisheries Compensation Protocol and underwater acoustic modelling report prepared by JASCO.	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	19-05-2023	Email TO relevant person	TGS emailed SRLL stating they had not heard anything back from the South Australian Rock Lobster Fishery in regards to their Otway Basin seismic survey and asked if that was an organisation that SRLL covers also.	N	N/A	* (see note above table)	Continuing consultation.
Southern Rock Lobster Limited	19-05-2023	Email FROM relevant person	SRLL replied to TGS' email sent earlier that day advising the SA rock lobster fishery has two other peak bodies (SA Northern Zone Rock Lobster Fishers Assn and the SA Rock Lobster Advisory Council) and provided contact names. SRLL advised if they are happy to delegate responsibility to SRLL then SRLL can confirm they cover those areas.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Southern Rock Lobster Limited	22-05-2023	Email TO relevant person	TGS replied to SRLL's email sent 19/05/2023 thanking SRLL for their help with this.	N	N/A	* (see note above table)	Continuing consultation.
Southern Shark Industry Alliance Inc.	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Southern Shark Industry Alliance Inc.	31-05-2022	Email TO relevant person	TGS/Schlumberger invited AFMA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Southern Shark Industry Alliance Inc.	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Shark Industry Alliance Inc.	24-04-2023	Email TO relevant person	TGS emailed SSIAI to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SSIAI to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Southern Shark Industry Alliance Inc.	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email FROM relevant person	SPL emailed SLB thanking them for their email and clarified the Indigo Central system is owned by a consortium and the information SLB provided about their proposed marine seismic survey will be passed on to their operations group. SPL advised they are an Indigo consortium member and would like to understand the activity in relation to both Indigo cables and look forward to SLB's reply.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email TO relevant person	SLB replied to SPL's email received earlier that day thanking them for their reply. SLB attached an information sheet about their proposed marine seismic survey, noting this is for environmental permitting only and the project has not been confirmed and the following additional points: - Operational Area is limited to Otway basin, VIC and TAS waters; - Type – Conventional 3D seismic survey; - Timing – there is an option for up to a maximum of 200 days per year (400 days total activity) within a 5 year period; and - Ideal start is December 2023, subject to permitting and regulatory approval. SLB also provided an image of the survey area and the Indigo Central cable. SLB closed the email asking SPL to let them know if they have any additional queries.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email FROM relevant person	SPL replied to SLB's email sent earlier that day and advised there is some additional information on their potential project that will need to be aware which will require SLB/TGS to sign a non-disclosure agreement before discussing further.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email TO relevant person	SLB replied to SPL's email received earlier that day regarding a non-disclosure agreement (NDA) and advised SPL the proposed marine seismic survey will be undertaken as a joint venture between SLB and TGS leading the acquisition. SLB advised TGS is better placed to proceed with discussion and NDA and will respond with an appropriate contact.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email TO relevant person	SLB emailed SPL regarding the proposed marine seismic survey including TGS within the email to continue discussions and progress a non-disclosure agreement with.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email TO relevant person	TGS replied to SLB's email including SPL and suggested they call SPL and provided contact details.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	8-06-2023	Email FROM relevant person	SPL emailed TGS providing them with a non-disclosure agreement for TGS to review and asked them to sign if theya re happy and return a copy for SPL to counter-sign.	Y - Non-disclosure agreement	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	9-06-2023	Phone call TO relevant person	TGS called SPL to discuss the non-disclosure agreement relating to information about submarine cable system that overlaps the operational area but there was no answer. TGS left a message to return their call.	N	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	14-06-2023	Email TO relevant person	TGS emailed SPL providing them a reviewed copy of the non-disclosure agreement with amendments and asked them to call TGS if they have any questions.	Y - Non-disclosure agreement	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	14-06-2023	Email FROM relevant person	SPL replied to TGS' email sent earlier that day with changes to the non-disclosure agreement advising they have accepted the amendments and attached an execution copy asking TGS and SLB to sign and return to SPL for countersigning.	Y - Non-disclosure agreement	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	15-06-2023	Email TO relevant person	TGS replied to SPL's email received the day before and provided signed non-disclosure agreement for them to countersign.	Y - Non-disclosure agreement	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	15-06-2023	Email FROM relevant person	SPL replied to TGS' email sent earlier that day providing TGS a copy of the signed non-disclosure agreement.	Y - Non-disclosure agreement	N/A	* (see note above table)	Continuing consultation.
SUBCO Pty Ltd	16-06-2023	Email TO relevant person	TGS replied to SPL's email received the day before thanking them and asking for a suitable time to meet regarding their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Superfresh Scallops	9-06-2023	Email TO relevant person	TGS emailed SS seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from SS to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS also provided information to help SS provide feedback on the proposed survey, explaining EPA's rights and TGS' obligations through the consultation process. TGS asked SS to advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet and NOPSEMA consultation guidance	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Superloop Ltd	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Superloop Ltd	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Superloop Ltd	27-03-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is planning to undertake marine seismic survey in Otway Basin including background information about minimum depth and methodology for generating soundwaves. TGS offered if Superloop have any concerns to let them know as can provide further information. TGS also commented it would be good to hear from Superloop as to whether there is any other information they required about the proposed survey or if they are satisfied with the information they have been provided.	N	Continuing consultation	* (see note above table)	Continuing consultation
Superloop Ltd	24-04-2023	Email TO relevant person	TGS emailed SL to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SL to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Superloop Ltd	6-05-2023	Email TO relevant person	TGS emailed Superloop providing an update on proposed marine seismic survey planning to commence October 2023 pending NOPSEMA approval. TGS said they'd like to hear from Superloop to confirm information pertaining to their survey is being received as they have not received any responses. TGS asked Superloop to advise if there is any planned maintenance or works scheduled on the Indigo Central submarine cable system located within their survey area (image provided) over the next four year period.	N	N/A	* (see note above table)	Continuing consultation.
Superloop Ltd	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	16-02-2023	Email FROM relevant person	Automated reply acknowledging receipt of email and advising TGS will hear from them within 10 working days.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surf Coast Shire Council	28-02-2023	Email TO relevant person	TGS responded to SCSC's email sent 28/02/2023 thanking them for their email. TGS confirmed they had the correct person for the letter to be addressed to.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	28-02-2023	Email FROM relevant person	SCSC advised the Mayor of their Council will be responding to TGS. SCSH asked for confirmation on the correct person the Mayor's letter should be addressed to.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surf Coast Shire Council	24-04-2023	Email TO relevant person	TGS emailed SCSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information, even though SCSC advised the mayor would respond. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SCSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	24-04-2023	Email FROM relevant person	Automated email responding to email TGS sent earlier in the day acknowledging email and advising TGS will hear from SCSC within 10 working days.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surf Coast Shire Council	26-04-2023	Email FROM relevant person	SCSC replied to TGS' email sent 24/04/2023 thanking TGS for following up on initial emails from February. SCSC commented they are not sure what happened to their response but this email provided a formal submission summarised below: - seismic testing and its impact on the marine environment and fossil fuel exploration and development in the Otway Basin is a matter of significant concern to their community and Council. - Concerns include potential negative impacts of seismic testing, gas exploration and development on country, the marine and coastal environment, the local economy, traditional owners and their local communities. - The region's economic profile relies on a healthy natural environment and tourism it attracts, particularly along the Great Ocean Rd. - They are concerned about continued fossil fuel exploration and development in face of climate change. - Council passed a motion to oppose oil and gas exploration in the Otway Basin in July 2021 which included a resolution , which remains Council's position and they continue to deliver on their advocacy commitments in that resolution. - Council will make a submission to NOPSEMA during the public consultation period reiterating their opposition. - Council remains committed to addressing climate change recognising the dire threat it poses to the environment, health and wellbeing, their local businesses and industry, quoting their Climate Emergency Response Plan 2021-2031. SCSC closed their email by offering to discuss further if TGS would like (details provided). Refer to Appendix H for the detailed submission.	Y - Formal submission	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Surf Coast Shire Council	1-05-2023	Email TO relevant person	TGS replied to SCSC's email received 26/04/2023 providing formal submission from their mayor. TGS acknowledge their council's and community's concerns and the Council's stance taken on oil and gas activities and climate change. TGS advised they are proposing a number of control measures to ensure the impacts of their seismic survey do not have any harm on the environment or receptors living within the marine environment. TGS offered further information to SCSC if they wanted more details on the control measures and advised this information will also be included within the environment plan once complete and goes out for public comment. TGS reiterated SCSC's comment in their submission regarding the environment plan being publicly notified once NOPSEMA accepts it as complete, which provides the opportunity for anyone to make a submission on the application. TGS closed their email thanking SCSC for their time in responding and offered for them to contact TGS if they have any further queries.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	25-05-2023	Email TO relevant person	TGS emailed SCSC to advise they will be visiting their area and to see if they would be interested in meeting to discuss their proposed marine seismic survey within the Otway Basin. TGS advised would be an opportunity for TGS to provide an overview of the project and discuss some of the concerns raised in their submission received 26/04/2023 so TGS can better understand the region's values and they can address them going forward. TGS asked if a meeting on 30/05/2023 would suit them, alternatively they could arrange an online meeting at a later date. TGS closed their email by advising they are planning on submitting their environment plan to NOPSEMA for a completeness check soon and would be great to include any feedback that SCSC may have. TGS also mentioned there is a public consultation period following that as another opportunity to provide additional information.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	2-06-2023	Email FROM relevant person	The SCSC Environmental Coordinator emailed TGS to arrange a meeting with TGS to learn more about their proposed seismic survey activities. SCSC confirmed an online meeting would be fine. SCSC advised their position provided in letter from SCSC dated 14/03/2023 opposing all new oil and gas remains Council's position and they have communicated this to other operators within the Otway Basin, the local registered Aboriginal parties, Federal government, state government and other councils across Australia and will continue to advocate this position on behalf of their community. SCSC asked TGS to note this position within TGS' consultation record and added they are interested current and proposed gas exploration and development in the Otway Basin and believe they are a relevant person and appreciate being consulted. SCSC continued to explain their concern with fossil fuel exploration and potential negative impacts on Country, the marine and coastal environment and local economy, traditional owners and local communities. SCSS added their region relies on a healthy natural environment and the tourisms it attracts. SCSC is concerned about the continued fossil exploration and development in relation to climate change.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Surf Coast Shire Council	7-06-2023	Email TO relevant person	TGS replied to SCSC's email received 02/06/2023 thanking them for their response and wanting to arrange a meeting. TGS advised SCSC they have noted Council's position opposing oil and gas development within the Otway Basin and this has been logged within the environment plan consultation records. TGS also agreed they are a relevant person and will include them within their ongoing consultation program. TGS noted their concerns relating to fossil fuel exploration and preference to be consulted via email. TGS also advised SCSC they will provide them with meeting minutes and a copy of the presentation for their records. TGS closed the email suggesting a date and time for an online meeting.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	8-06-2023	Email FROM relevant person	SCSC replied to TGS' email sent 07/06/2023 thanking TGS for following up regarding their request to meet. SCSC advised their availability for a meeting. SCSC thanked TGS for responding to their requests regarding the environment plan consultation record and council's position and confirming council's status as a relevant person.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	8-06-2023	Email TO relevant person	TGS replied the SCSC's email received earlier that day confirming a meeting date and time and asked SCSC to advise if that doesn't work and they can deliver a shorter presentation and answer any questions via email.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	8-06-2023	Email TO relevant person	TGS emailed SCSC a meeting invite to discuss Council's concerns with their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Surf Coast Shire Council	8-06-2023	Email FROM relevant person	SCSC replied to TGS' email sent earlier that day confirming the meeting date and time and thanking TGS for setting up a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Surfers for Climate	17-08-2022	Email FROM relevant person	The stakeholder reached out to request a meeting with TGS/Schlumberger to provide feedback on the proposal at the earliest convenience.	Y - Consultation request	Stakeholder has raised an objection, claim or concern. TGS/SLB distinguishes between persons or organisations who have a specific and established function, interest or activity relevant to the EP Area, and persons or organisations who have a general interest in the activity or region, or those who generally oppose seismic surveys or oil and gas exploration. While all persons are entitled to provide views on the activity, engagement with persons generally opposed to seismic surveys or oil and gas activities may not provide for constructive discussions about the effective management of survey activities to reduce the potential impacts and risks to the environment and genuine stakeholders. Given this, TGS/SLB has not engaged with the stakeholder during the preparation of the EP, but it is noted that there is the opportunity for their feedback to be received during the 30-day public comment period that will apply upon submission of this EP.	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Surfers for Climate	04-09-2022	Email FROM relevant person	The stakeholder reached out to follow up on their request for a meeting with TGS/Schlumberger to provide feedback on the proposal at the earliest convenience.	N	Stakeholder has raised an objection, claim or concern. TGS/SLB distinguishes between persons or organisations who have a specific and established function, interest or activity relevant to the EP Area, and persons or organisations who have a general interest in the activity or region, or those who generally oppose seismic surveys or oil and gas exploration. While all persons are entitled to provide views on the activity, engagement with persons generally opposed to seismic surveys or oil and gas activities may not provide for constructive discussions about the effective management of survey activities to reduce the potential impacts and risks to the environment and genuine stakeholders. Given this, TGS/SLB has not engaged with the stakeholder during the preparation of the EP, but it is noted that there is the opportunity for their feedback to be received during the 30-day public comment period that will apply upon submission of this EP.	* (see note above table)	Continuing consultation
Surfers for Climate	15-02-2023	Email TO relevant person	Reconnected with relevant person to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surfers for Climate	15-02-2023	Email TO relevant person	Reply email to SFC thanking SFC and asking to please let TGS know if they require further information.	N	N/A	* (see note above table)	Continuing consultation.
Surfers for Climate	15-02-2023	Email FROM relevant person	Reply email from SFC thanking TGS for message and advising they will respond before the date listed.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfers for Climate	24-04-2023	Email TO relevant person	TGS emailed SFC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SFC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	1-03-2023	Email FROM relevant person	SFA emailed TGS advised they are a non-profit organisation that represents communities around the protection of Australian oceans and coastlines, representing 18 local branches around Australia. SFA advised there are two branches representing communities in both Tasmania and Victoria (details provided) that will need updated and consulted on any plans regarding the Otways Exploration Drilling. SFA closed the email advising they look forward to hearing from TGS and thanked them for their time.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Surfrider Foundation Australia	3-03-2023	Email TO relevant person	TGS responded to SFA's email dated 01/03/2023 acknowledging their effort to reach out as TGS work through identifying who they need to liaise with. TGS advised they have logged their details for future correspondence for the Tasmania and Victoria branches and asked if they had a contact name for the Tasmania branch (noting they had included them in this response). TGS provided information about their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 16/03/2022.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	24-04-2023	Email TO relevant person	TGS emailed SFA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked SFA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	29-04-2023	Email FROM relevant person	SFA replied to TGS' email sent 24/04/2023 advising the survey is a big issue for a large population of surfers and ocean lovers on the Surf Coast. SFA continued they feel there is not much awareness in the community about seismic blasting so they are starting to plan a community information forum to raise awareness in the community. SFA said they hope to have experts present in the areas of marine science, gas economy and perhaps the political side. SFA advised the date isn't set yet but considering the last week of May in Torquay (venue to be confirmed) with approximately 100 - 200 people. SFA closed their email asking if TGS would like to attend and make a presentation about their project.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	3-05-2023	Email TO relevant person	TGS replied to SFA's email received 29/04/2023 thanking them for their email. TGS said they acknowledge their issues and concerns and commend them on arranging a community information session to help educate all groups on what is involved with marine seismic surveying, adding there appers to be a lot of misinformation circulating in the area and this would be a great opportunity to discuss people's concerns and provide answers and reassurance. TGS advised they are interested in attending but woud like to know the following before committing: - what information would they like TGS to present and the community like to hear; - what would be the forum format; - will there be a facilitator to ensure proper and meaningful engagement. TGS closed the email confirming that TGS is committed to protecting the environment, while conducting operations in an environmental sustainable and responsible manner and why TGS is wanting to ensure their EP considers all environmental sensitivities and values within and around the area and why hearing from SFA is so important.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	9-05-2023	Email FROM relevant person	SFA Tasmania emailed TGS to introduce themselves and advise they are currently organising two community information sessions within Tasmania at Stanley and King Island. SFA extended an invitation TGS to attend these events to raise community awareness, discuss concerns and help educate all groups on what is involved with marine seismic surveying. Some of the community concerns and areas they would like more information include: - how are marine mammals protected during surveys; - what level of access do commercial and recreational fishermen have to the area being sureyed; - how many Australians do you employ and how many new jobs will be created from the survey; - will TGS be surveying in the marine parks. SFA advised they are planning the event to be a Q and A format for approximatly 1 hour and dates are yet to be confirmed but around mid-June for Stanely and King Island is last week of June of first week of July. SFA will be facilitating and helping organise the event.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	17-05-2023	Email TO relevant person	TGS emailed SFA Tasmania in response to their email dated 09/05/2023 thanking them for their information. TGS asked if SFA Tasmania would like TGS to reply to their queries raised in their email as they could run through a quick presentation online to provide an overview of the project and address the aspects. TGS commented they are committed to engaging with community and agree a community session is a great opportunity to hear the community's queries and concerns and help educate everyone as there appears to be a lot of mis-information circulating. TGS asked SFA to let them know when they have confirmed dates and they can advise if they can attend or not. TGS advised they are developing their environment plan before submitting to NOPSEMA for a completeness check and once the EP is complete, it will be released for public consultation where they can incorporate feedback from the SFA sessions. TGS asked if SFA had any input they'd like TGS to consider for NOPSEMA's completion check to let them know before 26/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	17-05-2023	Email TO relevant person	TGS emailed SFA Victoria to make sure they had received their email send 03/05/2023 regarding the community session they were planning for Torquay about marine seismic surveying and if they had more information about the session. TGS advised they are planning visit to the area and would like to attend the session if it would work with their timing.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	18-05-2023	Email FROM relevant person	SFA Tasmania replied to TGS' email sent the day before thanking them for their information and suggestions. SFA advised an online presentation was not necessary and the questions provided in their email were provided to assist TGS' preparation based on common questions from their experience with local communities. SFA advised they would return to their team and advise TGS if they have any input for consideration for NOPSEMA's completion check prior to 26/05/2023. SFA closed their email advising they would provide confirmed dates of the community information sessions as soon as possible.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	19-05-2023	Email TO relevant person	TGS emailed SFA Victoria following up from their email sent 17/05/2023 regarding their information session planned for Torquay and advised they are visiting the area week commencing 29/05/2023. TGS asked if they would be available to meet on 31/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	19-05-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent earlier that day regarding a meeting advising they had to delay their community information session but planning for 14/06/2023 in Torquay. SFA said it would be fantastic to have a presentation from TGS and asked if they would be available that day.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	25-05-2023	Email TO relevant person	TGS replied to SFA Victoria's email received 19/05/2023 advising they are potentially not available 14/06/2023 for a community information session but if SFA could confirm the date, TGS could rearrange other commitments to ensure they were available. TGS closed their email advising they could alternatively make the following week and to please let them know.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	29-05-2023	Email TO relevant person	TGS replied to SFA Victoria's email received earlier that day checking whether the community information session date was 14/07/2023 or 14/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	29-05-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent 25/05/2023 seeking whether the community information session could be moved to another date but SFA advised it can't be due to other commitments. SFA said they would greatly appreciate if the environmental advisor could change their commitments as their session is definitely confirmed for 14/07/2023. SFA advised they would be advising the community soon and provided the location and time details. SFA closed their email asking TGS to confirm whether their environmental advisor could attend or not and they will keep TGS informed of their format and presenters once organised.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	29-05-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent earlier that day confirming the community information session will be held on 14/06/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	30-05-2023	Email TO relevant person	TGS replied to SFA Victoria's email received the day before advising they will be able to attend their community information session and will make arrangements to be there.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	30-05-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent earlier that day thanking TGS for letting them know and they will keep TGS updated.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	31-05-2023	Email TO relevant person	TGS emailed SFA Victoria to request a phone call with them in relation to the community meeting and to let them know if 1 pm tomorrow 01/06/2023 they will be available.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	31-05-2023	Email FROM relevant person	SFA Tasmania emailed TGS to confirm their Stanley community consultation event (date, time and venue). SFA said they are yet to confirm the event at King Island but will confirm as soon as possible. SFA asked if TGS would like to present, advising they will prepare a run sheet for TGS to review. SFA explained they would appreciate TGS' attendance given the community's proximity to the proposed seismic activity and density of relevant stakeholders in the townships.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	1-06-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent 31/05/2023 requesting a phone call to discuss the upcoming SFA community session. SFA said they would prefer to communicate via email and they are happy to answer any queries they have.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Surfrider Foundation Australia	2-06-2023	Email TO relevant person	TGS emailed SFA Victoria to advise they are cancelling their attendance at their community session planned for 14/06/2023. TGS explained they had been made aware of information recently posted on SFA social media about TGS and seismic surveying that is untrue, inaccurate and misleading and a session would potentially expose their employees and supporting experts and advisors to a hostile environment. TGS added they don't feel they would have a fair opportunity to present their project and receive constructive and reasonable feedback relevant to the scope of the activity. TGS provided some factual information within the email about seismic surveying and TGS. TGS mentioned the mis-information generated and distributed potentially endangers relationships with other groups willling to work with TGS towards better environmental outcomes. TGS offered an online meeting to proved an overview of their project and receive feedback relevant to their project scope. TGS closed the email asking SFA to advise if they would like to arrange an online meeting and if so, to provide a suitable date and time.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	5-06-2023	Email FROM relevant person	SFA Victoria replied to TGS' email sent 02/06/2023 apologising for the mis-information shared on social media and confirmed they understand TGS is not extracting. SFA advised they removed some of the information from social media 02/05/2023 and they would like TGS to know they are committed to continue learnining about seismic activity and this highlights the lack of awareness in the community and need for a information sessions. SFA believe it would be beneficial for TGS to attend the session to clarify what their activity entails and TGS' involvement in the overall exploration/extraction process. SFA continued they are committed to ensuring the opposite of a hostile environment. SFA provided a draft run sheet for the session, providing TGS 15 minutes but offering longer if needed. SFA closed their email asking TGS to reconsider attending the session in person and asked TGS to confirm if their representatives can attend on 14/06/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	7-06-2023	Email TO relevant person	TGS replied to SFA Victoria's email received 05/06/2023 to confirm that TGS will not be attending the SFA information session in-person, offering an online meeting as an alternative.TGS added this would allow other SFA members from outside Torquay (e.g. Tasmania) to attend. TGS asked SFA Tasmania if they'd like to proceed with an online meeting and they will arrange a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	7-06-2023	Email TO relevant person	TGS replied to SFA Tasmania's email received earlier in the day to advise TGS will not be attending the SFA information sessions in-person, offering an online meeting as an alternative. TGS asked SFA Tasmania if they'd like to proceed with an online meeting and they will arrange a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Surfrider Foundation Australia	7-06-2023	Email FROM relevant person	SFA Tasmania emailed TGS to confirm their King Island community consultation event and asked if TGS would like to present, advising they will prepare a run sheet for TGS to review. SFA explained they would appreciate TGS' attendance and commit to a respectful and professional environment to present and engage local communities.	N	Continuing consultation	* (see note above table)	Continuing consultation
Surfrider Foundation Australia	9-06-2023	Email FROM relevant person	SFA Tasmania replied to TGS' email sent 07/06/2023 regarding TGS declining SFA's invitation to attend their community information sessions and asked TGS for their reasoning. SFA commented declining attendance and offering an online meeting severaly restricts community participation and see this as an attempt by TGS and SLB to minimise community engagement. SFA is disappointed given they are primarily at risk fo seismic impacts and have a right to be informed and express concerns. SFA asked whether TGS plan any in-person meetings for the Tasmanian community.	N	N/A	* (see note above table)	Continuing consultation.
Tasman Council	2-05-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS advised they will be visiting Tasmania later that week if they'd like a for a meeting. Requested any feedback be provided prior to 10/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tasman Council	2-05-2023	Email FROM relevant person	Automated email received in response to TGS' email sent earlier that day thanking TGS for contacting TC. TC advised the email had been forwarded to the relevant officer for further response.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasman Council	10-05-2023	Phone call TO relevant person	TGS called TC to follow up on their email sent 02/05/2023 regarding their proposed marine seismic survey within the Otway Basin. The TC reception advised the General Manager would call TGS back the following day.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasman Council	15-05-2023	Phone call TO relevant person	TGS returned phone call and voice mail message from TC General Manager received earlier that day regarding their proposed marine seismic survey but there was no answer. TGS left a message to call them back.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasman Council	15-05-2023	Phone call FROM relevant person	The TC General Manager called TGS back responding to email TGS sent on 02/05/2023 regarding their proposed marine seismic survey within the Otway Basin. TGS did not answer the call so TC left a message advising that based on the information provided, it doesn't appear there will be any impact on the Tasman Peninsula but if there is likely to be any impact, could they please call back.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasman Council	16-05-2023	Email FROM relevant person	TC emailed TGS thanking them for their call earlier that day and apologised for it taking so long to connect. TC advised they have no further comment on this matter (TGS' proposed marine seismic survey within the Otway Basin). TC closed their email by stating that when the information has been collected, they may have an interest in knowing the results of the surveying.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasman Council	16-05-2023	Phone call TO relevant person	TGS called TC to follow up on emails and messages from the day before. TC confirmed their position regarding the proposed marine seismic survey that TC has no further comment and they may have an interest once the information has been collected. TGS asked if TC could provide this information in an email for their records and TC confirmed they would send an email.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasman Council	16-05-2023	Email TO relevant person	TGS replied to TC's email received earlier that day thanking them for their time regarding their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	14-03-2023	Phone call TO relevant person	TGS called TACI to follow up on email and factsheet sent 16/02/2023 and spoke to receptionist whom confirmed the original email had been forwarded to the CEO. The receptionist asked when a response is needed by and TGS advised by the end of March 2023. TGS advised they would like the opportunity to talk so TACI could voice any concerns. The Receptionist advised they had sent another email to the CEO to advise them that TGS had offered to meet to discuss and to call TGS on mobile or contact by email.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	22-03-2023	Email TO relevant person	TGS emailed TACI to provide them with an updated version of the factsheet which is more concise and provides an explanation of why TGS is wanting to consult with TACI on their planned project. TGS continued the factsheet explains what a marine survey is, what are the potential effects on the environment, the measures TGS has in place to limit the potential effects and safeguards in place should an unexpected event occur. TGS said they would like to meet TACI online to share TGS's plans and whether TACI has any concerns and can arrange an online meeting at their convenience to discuss. TGS closed the email by thanking TACI and advising they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	27-03-2023	Phone call TO relevant person	TGS called TACI to follow up on email sent to TACI on 22/03/2023. The TACI receptionist confirmed they had received the factsheet and it had been forwarded to the CEO. TACI could not provide contact details for the CEO but advised they would let them know that TGS had requested a meeting and they would contact TGS directly if they wanted to meet.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	11-04-2023	Email TO relevant person	TGS emailed TACI to follow up on phone call from 27/03/2023 and email sent 22/03/2023 in regards to a potential meeting. TGS said that TACI had mentioned the information had been forwarded to the CEO and they would contact TGS if they want to meet. TGS said they were emailing to check if the CEO would like to meet TGS to discuss the proposed survey or any concerns they may have.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	20-04-2023	Phone call TO relevant person	TGS called TACI to follow up on email sent to TACI on 11/04/2023 and spoke to the receptionist. The TACI receptionist confirmed the previous email had been sent to their CEO but advised the CEO may not respond. The receptionist said they would send a friendly reminder and try to get a response and sent this response back to TGS.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	26-04-2023	Phone call TO relevant person	TGS called TACI to follow up on email sent to TACI on 11/04/2023 and phone call from 20/04/2023 but there was no answer. TGS left a message advising that TGS would be visiting Tasmania next week and would welcome a meeting and to please call back to discuss.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	26-04-2023	Email TO relevant person	TGS emailed TACI following a phone call earlier that day. TGS advised they are planning a visit to Tasmania next week and planning on visiting Hobart and would welcome the opportunity to meet. TGS closed the email asking TACI to advise when is convenient for TACI.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	28-04-2023	Phone call TO relevant person	TGS called TACI to follow up on previous correspondence regarding a possible meeting while TGS is visiting Hobart. TACI confirmed they had received TGS' email and forward again to the relevant people and try and arrange something and get back to TGS.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	1-05-2023	Phone call TO relevant person	TGS called TACI to follow up on previous phone call made 28/04/2023 and the TACI receptionist advised the CEO was going on leave and suggested contacting the Sea Country Coordinator within TACI (name and contact details provided) as the proposed survey is located offshore and potentially state government cultural heritage.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	1-05-2023	Email TO relevant person	TGS emailed TACI following a phone call earlier that day. TGS advised they are planning a visit to Tasmania next week and would welcome the opportunity to meet to discuss their proposed marine seismic survey in the Otway Basin offshore Tasmania. TGS said ths would be an opportunity for TACI to hear about TGS' plans and more importantly hear if they have any concerns. TGS attached an information sheet on the planned survey and advised this provides an explanation of why they are wanting to consult with TACI. TGS continued the sheet highlights aspects of what a marine seismic survey is and what are the potential affects on the environment, the measures TGS have in place to limit those potential affects and also what safeguards they will have in place should an unexpected event occur.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tasmanian Aboriginal Centre Inc (TACI)	2-05-2023	Email FROM relevant person	TACI replied to TGS' email sent 01/05/2023 providing a submission on the proposed TGS seismic survey in the Otway Basin. TACI advised they are not available to meet this week but would welcome TGS' consideration and response to their concerns and issues they have about the project. TACI explained they are an Aboriginal community organisation established in the 1970s representing the political and community development aspirations of the Tasmanian Aboriginal community. TACI provided an explanation of the work they have carried out including establishing Tasmania's first indigenous protected area. TACI provided the following summarised comments in regards to the proposed survey: - TACI opposes oil and gas exploration and development due to the risk the activities pose to the marine environment, marine species and their community's connect to and enjoyment of sea country. - An incident such as a leak or spill are too great and could pose long-term, if not permanent catastrophic impacts. - TACI thinks the evidence that seismic survey does not have significant impacts on phytoplankton and other marine species is lacking and a precautionary approach should be taken whereby exploration is only undertaken once these impacts are properly understood and can be mitigated. - TACI oppose the expansion of the fossil fuel industry. - TACI is dismayed that such development proposes no benefits for Aboriginal people, nor any genuine recognition for the custodianship Aboriginal people have for sea country or their efforts in carbon-abatement. - TACI do not consider TGS' communication with TACI about this project is genuine as it doesn't recognise their community's needs, advising consultation with Aboriginal people must respect cultural mores, spiritual beliefs, cultural knowledge and custodianship of Country borne by Aboriginal people. - TACI advised as an Aboriginal community-controlled organisation, they must focus their work on where they can make a difference for their people and country and cannot undertake or support consultation where there is no discernable benefit for their people. TACI closed their email stating that for TACI to engage in genuine consultation on this project, TGS must: - commit to addressing their concerns about the environmental risks of the project; - identify how their people would benefit from the project; and - supply resources to enable them to genuinely engage their community on the project.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the claims are addessed in the following sections: Impacts to phytoplankton/marine species: **Section 7.2** discusses in detail the outcomes of underwater noise modelling, evaluation of known and potential impacts to sensitive environmental receptors, and sets out the control measures for ensuring risks are As Low As Reasonably Practicable (ALARP) and to Acceptable Levels. In addition, **Section 9** sets of the approach and framework for assesment of cumualtive effects, which TGS are concurrently engaging with current operators and title holders to ensure the application of a meaningful proces to acknowledge and account for data gaps in cumualtive imapct assesment is addressed. Impacts of leaks/spills: Section 8.3 discusses in detail the outcome of potentail worst case oil spill scenario modelliings, and impacts for sensitive receptors. Control measures are listed in Table 126, these ensure risks are As Low As Reasonably Practicable (ALARP) and to Acceptable Levels. Ongoing consultation with TACI will be undertaken in accordance with the methods set out in **Section 5** to ensure TACI have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult with TACI and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	10-05-2023	Email TO relevant person	TGS replied to TACI's email received 02/05/2023 providing a formal submission regarding the proposed marine seismic survey within the Otway Basin. TGS acknowledged the information TACI had provided regarding the connection between the people of the land and the sea. TGS advised they note TACI's comments and concerns and further explained the reasons why they would like to meet with TACI, including ensuring TACI has sufficient information to make an informed decision on how the proposed survey may impact them. TGS provided an overview of what the meeting would involve including an opportunity to discuss specific concerns. TGS closed the email asking whether TACI would be willing to discuss how TGS can best engage with their communities to ensure they are heard and considered and confirmed they would be willing to consider resources that would be required to do this. TGS asked TACI to suggest a suitable date and time to meet.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Aboriginal Centre Inc (TACI)	22-05-2023	Phone call TO relevant person	TGS called TACI to follow up on their email sent 10/05/2023 but there was no answer so TGS left a message for TACI to call them back.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Aboriginal Centre Inc (TACI)	22-05-2023	Email TO relevant person	TGS emailed TACI to follow up on their email sent 10/05/2023. TGS advised TACI's comments have been noted and addressed within their environment plan however would still like the opportunity to discuss their concerns and explain the measures to minimise impacts from their proposed survey. TGS asked if they have a suitable date and time to meet the current week. TGS also advised they are developing their environment plan before submitting to NOPSEMA for a completeness check and once the EP is complete, it will be released for public consultatio. TGS advised they hope to incorporate additional feedback from a meeting with TACI prior to their submission to NOPSEMA, however if TACI can't meet they asked TACI to let them know if they had any input they'd like TGS to consider for NOPSEMA's completion check before 26/05/2023.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Association for Recreational fishing (TARFish)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tasmanian Association for Recreational fishing (TARFish)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Association for Recreational fishing (TARFish)	24-04-2023	Email TO relevant person	TGS emailed TARFish to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TARFish to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Association for Recreational fishing (TARFish)	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Association for Recreational fishing (TARFish)	22-05-2023	Phone call TO relevant person	SLB called TARFish to follow up on unanswered emails regarding their proposed marine seismic survey however there was no answer. SLB left TARFish a message to return their call at a convenient time.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Association for Recreational fishing (TARFish)	25-05-2023	Email TO relevant person	TGS emailed an alternative contact at TARFish advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 31/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Conservation Trust	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Conservation Trust	24-04-2023	Email TO relevant person	TGS emailed TCT to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TCT to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Conservation Trust	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Regional Aboriginal Communities Alliance (TRACA)	27-02-2023	Online enquiry form submitted	TGS submitted an online enquiry form advising TGS is planning to undertake marine seismic survey in Otway Basin and seeking to engage with TRACA as a potential relevant person in accordance with government consultation requirements. TGS advised that if TRACA provide an appropriate contact, they will provide more information. TGS also advised they would like to knowwhether TRACA has any interests or activities that may be affected by the survey so TGS can learn what these might be and discuss how any impacts may be avoided or mitigated. TGS also invited TRACA to let them know if they would like to ask any questions or meet in person to go over the proposed survey.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Regional Aboriginal Communities Alliance (TRACA)	14-03-2023	Email TO relevant person	TGS emailed TRACA following an online query submission on 27/02/2023 including information about the proposed survey. This email provided the factsheet again and background information about the location, depth, equipment, timing, experience and request for TRACA to provide feedback. TGS advised a shorter factsheet would be provided to them over the next coming days to hopefully prompted discussions with them about any concerns they may have regarding the proposed survey. TGS asked if they could let them know if they have time to discuss (phone call or online meeting) to present the survey and concluded the email stating they look forward to hearing from them.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Regional Aboriginal Communities Alliance (TRACA)	22-03-2023	Email TO relevant person	TGS emailed TRACA to follow up on email TGS sent 14/03/2023 and to provide an updated version of the factsheet for Traditional Owner groups. TGS advised they would like to get some time online with TRACA to discuss their plans and more importantly hear if they have any concerns and could arrange a meeting at their convenience to discuss. TGS closed the email by thanking TRACA and stating they look forward to hearing from them.	Y - updated factsheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Rock Lobster Fisherman's Association	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Maps of the Victorian fisheries that operate in or adjacent to the EP Area - A map of the survey relative to Tasmanian fisheries reporting blocks - A map of the survey relative to SA fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tasmanian Rock Lobster Fisherman's Association	13-05-2022	Email TO relevant person	TGS state they are contacting TRLFA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, Maps of SA&Tas fisheries reporting blocks, information sheet, maps and summary of Victorian fisheries	N/A	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tasmanian Rock Lobster Fisherman's Association	31-05-2022	Email TO relevant person	TGS/Schlumberger invited the stakeholder to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Tasmanian Rock Lobster Fisherman's Association	31-05-2022	Email FROM relevant person	The stakeholder gave the name of the representative that will represent TRLFA for the stakeholder meeting on 2 June 2022.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Rock Lobster Fisherman's Association	2-06-2022	Email TO relevant person	Thanking TRLFA for providing a contact (Tom Consentino) and looking forward to speaking with him	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Rock Lobster Fisherman's Association	23-06-2022	Email TO relevant person	TGS/Schlumberger noted that at the first stakeholder briefing session on the 6th June, it was indicated that the Southern Rock lobster Ltd would be the central point of contact for consultation with all of the State rock lobster fisheries. TGS/Schlumberger acknowledged that the survey area does not overlap areas of significant rock lobster fishing, but welcomed an additional meeting to answer any questions regarding impacts to lobster of giant crab fishing from the project. TGS/Schlumberger asked if TRLFA could communicate a time when the meeting could be held.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Rock Lobster Fisherman's Association	31-08-2022	Meeting with relevant person	The stakeholder asked about the difference between the Otway Basin 3D MSS and the previous 2D MSS. TGS/Schlumberger explained that the 2D MSS conducted by SLB in 2020 was a sparse survey, while the 3D MSS would be more densely focused over smaller areas with lines 600 m apart using a smaller source volume and shorter SP intervals. The stakeholder expressed appreciation that the seismic source would not be operated in the Giant Crab Exclusion Zone (GCEZ) but were concerned about larvae being affected outside of this area. The stakeholder asked how feasible it is for resources to be developed in deeper waters. TGS/Schlumberger explained that TGS/SLB acquire data to inform about seabed characteristics and clients would then decide the feasibility of developing any resources. Refer to Appendix I for detailed meeting minutes.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Rock Lobster Fisherman's Association	07-09-2022	Meeting with relevant person	The stakeholder raised concern around crab and lobster spring / spawning time, and juvenile stock. TGS/Schlumberger/ERM emphasised the main focus of the survey controls is to avoid impacts to spawn biomass i.e. adult stock. Studies have indicated no mortality impacts to larvae but may affect development. Stakeholder queried if there will be compensation available, and TGS/Schlumberger/ERM confirmed compensation will be available around displacement and loss of catch related to displacement. The stakeholder raised concern that assumptions are being made regarding Giant Crabs with reference to other species. TGS/Schlumberger/ERM added that the aim of the controls associated with the survey is to avoid impacts to adults, the scale of impact to giant crab and rock lobster is usually very small. Several other queries were discussed. Refer to Appendix I for detailed meeting minutes.	N	Stakeholder has raised an objection, claim or concern. The objection, claim or concern is addressed in the EP. Impacts to larvae and recruitment of giant crab and rock lobster are assessed in the EP. The magnitude and extent of effects from a seismic survey (transient point source) are expected to be negligible in the context of natural mortality and variability at a regional scale. This was a point of contention and concern for stakeholders. TGS/SLB agreed to provide a link to the EP and relevant impact assessment sections when it is available.	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Map presenting the survey relative to Tasmanian fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	13-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Map presenting the survey relative to Tasmanian fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited TSIC to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	31-05-2022	Email FROM relevant person	TSIC advised that they would not be able to attend a meeting with stakeholders on June 2 2022, but would be free for a meeting on Thursday 9th or Friday 10th June 2022.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	2-06-2022	Email TO relevant person	TGS aiming to set up additional introduction sessions the week of the 6 June 2022 with invites being sent out invites following a call the next day.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	09-06-2022	Email FROM relevant person	TSIC declined an invitation to a stakeholder meeting to be held June 9th 12:30-1:30pm AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	09-06-2022	Email FROM relevant person	TSIC declined an invitation to a stakeholder meeting to be held June 10th 9:00-10:00am AWST.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	22-06-2022	Email TO relevant person	TGS/Schlumberger reached out to TSIC to express their desire to organise a meeting to discuss the survey and address any questions TSIC and the related fisheries may have regarding the survey. TGS/Schlumberger noted that consultation with rock lobster fisheries should go through Southern Rock lobster Ltd, but recognised that fisheries such as the SA Marine Scale fish Fishery and Giant Crab Fishery may have questions in relation to the project. TGS requested that TSIC communicate times that they would be available for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	24-06-2022	Email TO relevant person	Reply to initial email saying TSIC can't make the meeting, requesting them to suggest an alternative day for the introduction meeting.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	24-06-2022	Email FROM relevant person	TSIC declined an invitation to a stakeholder meeting to be held June 29th 9:00-10:00am AWST and expressed their desire for another meeting to be organised when they were available.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	24-06-2022	Email FROM relevant person	A stakeholder meeting was organised for 09:00-10:00 am AWST for Wednesday the 29th of June by TGS and declined by TSIC.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	25-06-2022	Email FROM relevant person	Suggesting a meeting time 1200 midday Tasmanian time 04/07/2022.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	25-06-2022	Email FROM relevant person	TSIC requested a meeting to be held with TGS/Schlumberger at 12:00pm Tasmanian time Monday 4th July.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	26-06-2022	Email TO relevant person	Email to check suggested meeting date is available.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	26-06-2022	Email TO relevant person	TGS/Schlumberger advised the stakeholder that they will check the time and date and respond in regards to organising a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	29-06-2022	Email FROM relevant person	A stakeholder meeting was organised for 10:00-11:00 am AWST for Monday the 4th of July by TGS and accepted by TSIC.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	04-07-2022	Meeting with relevant person	The stakeholder expressed concern around the location of the survey, particularly in the King Island area, as there is the potential to cumulative effects from several recent surveys. The stakeholder detailed that the biggest concern from fishers are the interactions of the survey with giant crab fishers on the west side of King Island, and overlap will occur with the survey area. The stakeholder emphasised that giant crabs could live up to a depth of 1,000 m, and the crab fishers are requesting this as a depth restriction for the current survey. However, the turning circle of the survey vessel could still impact giant crab fishing even if survey is pushed to deeper waters. The stakeholder explained that there is a recruitment corridor for rock lobster from SA to NW Tasmania (directly through the survey area) and there is little known about where the larvae will be and where they will settle. The stakeholder described how Giant crab fisheries are operating at historic low levels after poor recruitment and negative interaction with the Commonwealth Trawl Fishery. This has negatively impacted giant crab stocks. Recent years has seen the first good signs of recruitment in a long time and crab fishers are eager to preserve this. Refer to Appendix I for detailed meeting minutes.	N	Stakeholder has raised an objection, claim or concern. The objection or claim is addressed in the EP. Extended depths of giant crab habitat and fishing effort in water depths greater than the core depth range have been described and mapped in the EP. Impacts of received sound levels on the seabed in the 3D Active Source Area are predicted to have limited sub-lethal effects or no effects on crustaceans on the seabed due to the water depths and vertical propagation losses. However, request for exclusion of acquisition from water depths <1,000m for the Tasmanian fishery has been considered and adopted as a precautionary measure based on: - The Tasmanian giant crab stock is currently assessed as Depleted; - Tasmanian giant crab and the fishery are a described feature of the Zeehan AMP; - Stakeholder concern and potential scientific uncertainty regarding the sensitivity of giant crab; - Area can be excluded with limited loss of survey area and is therefore deemed practicable.	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	05-07-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for their attendance at the meeting and indicated that they will send through the meeting notes in the coming days. TGS/Schlumberger explained that they would appreciate engaging TSIC on a fee-for-service basis to facilitate engagement with potentially affected commercial fishers on King Island and in Tasmania. TGS and Schlumberger are to represent themselves but would appreciate support with communications and arranging in-person meetings that may be necessary. TGS/Schlumberger requested a quote for undertaking this support and potential timeframes for scheduling in-person meetings. TGS/Schlumberger expressed interest in engaging TSIC in providing survey notifications and daily updates should surveys go ahead (pending acceptance of the EP by NOPSEMA), and highlighted that currently the focus is on consultation for the EP.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tasmanian Seafood Industry Council (TSIC)	03-08-2022	Email TO relevant person	TGS/Schlumberger attached the meeting notes from the meeting on July 4th and explained that they are eager to receive feedback on the previous email regarding engaging TSIC to engage with potentially affected fishers in King Island and Tasmania. TGS/Schlumberger explained that the EP is on track to be submitted to NOPSEMA in August, but stakeholder engagement will be ongoing and meetings may still be organised.	Y - Meeting notes	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	08-08-2022	Email FROM relevant person	The stakeholder agreed to connect TGS/Schlumberger with relevant fishers on King Island and Tasmania. The stakeholder requested TGS/Schlumberger send through appropriate correspondence and maps, requests for meetings and potential times to meet for distribution to these third party stakeholders.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	8-08-2022	Email FROM relevant person	Email stating TSIC happy to connect TGS with relevant people on King Island and in the NW for discussions, and if TGS could provide appropriate correspondence and maps, request for meetings, times you could meet etc.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	18-08-2022	Email TO relevant person	TGS/Schlumberger asked for clarification regarding whether meetings with stakeholders would be in person or over Teams/Zoom. Potential days and times were proposed so as to include a consultant from ERM in the discussions. TGS/Schlumberger noted that they are proposing to exclude seismic acquisition in waters shallower than 1,000 m adjacent to Tasmanian fishing areas and have adopted this as a control in the EP. This control is a direct result of consultation with the stakeholder and discussion around concerns for fisheries such as the Giant Crab and Rock Lobster. TGS/Schlumberger agreed to provide additional maps with specific detail on Tasmanian fisheries ahead of a meeting.	Y -Map of Giant Crab acoustic exclusion area	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	22-08-2022	Email FROM relevant person	The stakeholder explained that crab fishers will welcome the exclusion of portions of their fishing grounds from the survey, and expressed that TSIC would promote online meeting with fishing stakeholders. The stakeholder requested some potential dates and times so this information can be passed on.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email FROM relevant person	The stakeholder advised TGS/Schlumberger that the Tasmanian Rock Lobster Fishermen's Association is sending out a newsletter during the week of the 29th August, and this could be an opportunity to include information on the proposed survey.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email FROM relevant person	The stakeholder confirmed that Wednesday 31 August at 11:00am AEST is most appropriate, and questioned as to who would be setting up a meeting and sending out invites.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email TO relevant person	TGS thank TSIC for proposing a new meeting time (Wed 31-Aug-2022 1:00 PM) and ask that the meeting invite be forwarded to others at TSIC who may want to attend.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email TO relevant person	TGS thank TSIC for proposing a new meeting time (Wed 31-Aug-2022 9:00 PM) and ask that the meeting invite be forwarded to others at TSIC who may want to attend.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email TO relevant person	TGS/Schlumberger proposed Monday, Tuesday or Wednesday of the week of the 29th August after 11am AEST.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	24-08-2022	Email FROM relevant person	The stakeholder accepted a meeting on Wednesday 31 August 9:00-10:00am AWST with TGS/Schlumberger.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	30-08-2022	Email TO relevant person	Change in meeting invite date, with a comment from TGS stating that due to unforeseen circumstances the meeting date needs to change.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	30-08-2022	Email FROM relevant person	The stakeholder agreed to communicate the new time but advised that they would not be able to attend or notify attendees of the cancellation on such short notice. The stakeholder suggested a representative from TGS/Schlumberger attend the online meeting at the original time to let attendees know the meeting has been rescheduled.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	30-08-2022	Email TO relevant person	TGS/Schlumberger communicated that the meeting would need to be rescheduled, and requested the stakeholder provide available times the following week.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	30-08-2022	Email TO relevant person	TGS/Schlumberger apologised for the late change in meeting time and any inconvenience caused, and explained they will be able to let any attendees know the meeting has moved once these stakeholders have dialled in.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	31-08-2022	Meeting with relevant person	The stakeholder asked about the difference between the Otway Basin 3D MSS and the previous 2D MSS. TGS/Schlumberger explained that the 2D MSS conducted by SLB in 2020 was a sparse survey, while the 3D MSS would be more densely focused over smaller areas with lines 600 m apart using a smaller source volume and shorter SP intervals. The stakeholder expressed appreciation that the seismic source would not be operated in the Giant Crab Exclusion Zone (GCEZ) but were concerned about larvae being affected outside of this area. The stakeholder asked how many more surveys would be conducted and if data from previous surveys is kept and used to avoid duplication of effort. TGS/Schlumberger explained that the multi-client approach means that TGS/SLB are able to licence data to any interested company, thus reducing the need for surveys to be conducted by multiple companies, and yes, historical data is kept and utilised. The stakeholder asked how long the survey has been in the planning phase and when TSIC had been notified. TGS/Schlumberger explained that TSIC were contacted in May 2022 as part of the stakeholder consultation process.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	31-08-2022	Email TO relevant person	Email thanking TSIC for their response and confirming there will be a revised map for attendees at the meeting that day.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	31-08-2022	Email TO relevant person	TGS requested the surnames of some of the meeting attendees and stated they would be included in future communications.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	31-08-2022	Email TO relevant person	TGS/Schlumberger assured the stakeholder that a representative would be present for the original online meeting time to present a revised map.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	01-09-2022	Email FROM relevant person	The stakeholder offered 2:00pm AEST on Wednesday the 7th as a potential meeting time.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email TO relevant person	TGS thanks TSIC for providing full names of contact persons.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email FROM relevant person	TSIC confirming meeting time and date.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email TO relevant person	Notifying TSIC that they should have received a teams invite from the stakeholder email address.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email TO relevant person	TGS suggesting a meeting time any time after 11AM AEST next Mon-Wed.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email TO relevant person	TGS thanks TSIC for providing meeting times and state they will await to hear from Julian Harrington before finalising a date.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email FROM relevant person	TSIC suggesting a prefered meeting time but are flexible.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email FROM relevant person	TSIC suggesting an afternoon time for next meeting as it will allow Fishers to attend.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	1-09-2022	Email FROM relevant person	TSIC confirming full names of contact persons.	N	No concerns raised Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	01-09-2022	Email TO relevant person	TGS/Schlumberger offered Monday the 5th, Tuesday the 6th or Wednesday the 7th after 11am AEST as potential dates for a rescheduled meeting.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	01-09-2022	Email TO relevant person	TGS/Schlumberger confirmed 2:00pm AEST and explained an invite will be sent out shortly to all attendees.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	06-09-2022	Email FROM relevant person	The stakeholder accepted a meeting on Wednesday 7 September 12:00-1:00pm AWST with TGS/Schlumberger.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	7-09-2022	Email TO relevant person (meeting request	Meeting request Wednesday, 7 September 2022 4:00 PM-5:00 PM.	N	N/A	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	07-09-2022	Meeting with relevant person	The stakeholder raised concern around crab and lobster spring / spawning time, and juvenile stock. TGS/Schlumberger/ERM emphasised the main focus of the survey controls is to avoid impacts to spawn biomass i.e. adult stock. Studies have indicated no mortality impacts to larvae but may affect development. Stakeholder queried if there will be compensation available, and TGS/Schlumberger/ERM confirmed compensation will be available around displacement and loss of catch related to displacement. The stakeholder raised concern that assumptions are being made regarding Giant Crabs with reference to other species. TGS/Schlumberger/ERM added that the aim of the controls associated with the survey is to avoid impacts to adults, the scale of impact to giant crab and rock lobster is usually very small.	N	Stakeholder has raised an objection, claim or concern. The objection, claim or concern is addressed in the EP. Impacts to larvae and recruitment of giant crab and rock lobster are assessed in the EP. The magnitude and extent of effects from a seismic survey (transient point source) are expected to be negligible in the context of natural mortality and variability at a regional scale. This was a point of contention and concern for stakeholders. TGS/SLB agreed to provide a link to the EP and relevant impact assessment sections when it is available.	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	16-02-2023	Email TO relevant person	TGS responded to TSIC's previous email and concern regarding exclusion of previously agreed Giant Crab Exclusion zone and apologised for not including the information in the fact sheet. TGS confirmed the 3D seismic data acquisition will not be undertaken in water depths less than 1,000 m in waters south and east of the 2D Tie Line Extension Area. TGS offered to let them know if they required additional information.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tasmanian Seafood Industry Council (TSIC)	16-02-2023	Email FROM relevant person	TSIC made a preliminary comment in response to previous email from TGS (dated 15/02/2023). TSIC expressed frustration that the map and information within the information sheet did not include or reference the previously agreed Giant Crab Exclusion Zone west of King Island and asked if this is still included within the EP and why this information was not included in the information and map.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	17-02-2023	Email TO relevant person	TGS forwarded a map provided the Giant Crab Exclusion Zone for the revised EP area and offered to let them know if they would like to set up a meeting to discuss.	Y - Upated EP area map including Giant Crab Exclusion Zone.	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	11-04-2023	Email TO relevant person	TGS emailed TSIC to arrange an online meeting to discuss recent changes to their proposed marine seismic survey, acknowledging their current high level of information requests. TGS advised they have had a change of environmental consultant and in a position to discuss progress with their EP, particularly in response to their concerns raised last September. TGS said they would are addressing any queries they may have before submitting their EP to NOPSEMA for consideration. TGS closed the email asking them to advise a suitable date and time for an online meeting and they will arrange. TGS attached the updated information sheet.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	26-04-2023	Email TO relevant person	TGS emailed TSIC advising TGS will be visiting Tasmania and hoping to meeting with TSIC to discuss the recent changes with marine seismic survey. TGS asked if TSIC could advise when they might be available for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	26-04-2023	Phone call TO relevant person	TGS called TSIC to arrange a meeting in Tasmania next week to discuss their proposed marine seismic survey but there was no answer. TGS left a message for TSIC to return there call.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	27-04-2023	Email TO relevant person	TGS emailed TSIC a meeting invite for 9:30 am on 04/05/2023 at TSIC office.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	27-04-2023	Phone call FROM relevant person	TSIC returned TGS' call from yesterday regarding arranging a meeting next week. Both parties confirmed a meeting for 04/05/2023 at 9:30 am at the TSIC office.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	4-05-2023	Meeting with relevant person	TGS, SLB and SLR met with TSIC to discuss the proposed marine seismic survey within the Otway Basin. Key queries and concerns discussed included the following: - Reduction in survey area. - Exclusion area west of King Island (no acquisition <1000 m). - Avoiding the munitions dump with buffers. - Southern lobster recruitment, potential stresses on larval cycle. - Stress on fishing industry from competing activities [for space] and volume of consultation. - Unknown nature of cumulative impacts on stock and recent activity west of King Island. - Level of fatigue within fishing community due to increase in consultation from various sources and industries. - TSIC would not support a marine seismic survey because of concerns (listed above). - Consultation process with revised guidance from NOPSEMA. - Modelling used to determine environment that may be affected. - TSIC represents most of fishing industry within Tasmania but could not speak directly for fishers but can assist with consultation. - Latest project design is less concerning but need more information on the reason for the survey in areas that appear to have been surveyed. TGS asked what other information could be included within consultation to help fishers and TSIC replied a two level approach with high level information about the activity followed by more in-depth descriptive document. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the claims are addessed in the following sections: Reduction in survey area: the survey area is described in **Section 3.2** (Survey Location) Exclusion area west of King Island (no acquisition <1000 m): to be discussed during ongoing consultation with TSIC Avoiding the munitions dump with buffers: **Section 7.2.3.3** (effects of acoustic disturbance to UXOs and Defence Activities), including the Acoustic Exclusion Area of 3 NM around the centre point of UXO site SDS006 (see **Table 84** for Control Measures). Southern lobster recruitment, potential stresses on larval cycle: Section 7.1.3.1.2 Victoria Fisheries- Rock Lobster), Section 7.1.3.1.5 (Summary of Potential Impacts to Commercial Fisheries), Section 7.2.2.2.1 (acoustic effects to plankton, includingn rock lobster larvae), Section 7.2.2.2.1.4 (acoustic effects on Rock Lobster Larvae). It is noted the Giant Crab Acoustic Exclusion Area also provides for protection to rock lobster (see Table 81). Effects to commercial fishing industry: Section 7.1.3.1 (impacts of the physical presence of the seismic survey vessels), Section 7.2.3.1 (imapcts of acoustic disturbacne on fisheries), Section 8.2.3 (imapct of streamer loss), Section 8.3.4.1 (hydrocarbon spill), and Table 84 includes control measures for adressing commercial fishers compensation in accordance with agreed protocols. Spatial avoidance of fishing grounds: Table 84 lists the control measure for compensation to fishers for any claims received in accordance with the agreed compensation protocol. Cumulative impacts on stock and recent activity west of King Island: Table 84 lists control measures to require a SIMOPS plan, which inlcudes the implementation of a 40 km spatial separation between Seismic Vessels. Section 9 sets out the approach to manageing Cumulative Impacts. Outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP.	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)						Consultation fatigue: Section 5 described the consultation programme methodology in detail. Particular emphasis is given to the bespoke nature of Relevant Persons requirements, and the approach TGS follows to enable consultation is meaningful and genuine, and sufficient information and time is given to all Relevant Persons. The bespoke / case-by-case nature of the programme ensures all efforts are in place to reduce consultation fatigue, and to ensure it is targeted to specific requirements of Relevant Persons Consultation process with revised guidance from NOPSEMA: Section 5.1 (Relevant Persons Consultation - Regulatory Requirements and Guidelines) described the regualtory framework in detail, including the revised guidance from NOPSEMA for undertaking consultation with Relevant Persons. Modelling used to determine environment that may be affected: Section 4.1 (Environment that May Be Affected) describes the method to define the EMBA. Ongoing consultation with TSIC will be undertaken in accordance with the methods set out in Section 5 to ensure TSIC have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult with TSIC and endeavour to provide assurances of its environmental protection measures for its projects.	
Tasmanian Seafood Industry Council (TSIC)	8-05-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	10-05-2023	Email TO relevant person	TGS emailed TSIC to provide them with minutes from their meeting on 04/05/2023. TGS closed the email advising it would be great to get their fee for service agreement document for review.	Y - Meeting minutes	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	10-05-2023	Email FROM relevant person	Automated reply to TGS' email sent earlier that day advising TSIC is out of the office.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	15-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Consultation proposal	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	16-05-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	17-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Updated consultation proposal	Continuing consultation	* (see note above table)	Continuing consultation
Tasmanian Seafood Industry Council (TSIC)	17-05-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	18-05-2023	Email TO relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Draft subcontractor agreement.	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	19-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	30-05-2023	Email To relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference. SLR also advised TSIC that TGS is planning a community session on King Island as part of their consultation program and asked if TSIC would be available to meet with them and any fishers that were available at King Island around the time of their visit.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	31-05-2023	Email FROM relevant person	Confidential - Regarding commercial arrangements (fee-for-service). Information is available in the Sensitive Matters Report for NOPSEMA reference. TSIC asked SLR to clarify what dates they are visiting King Island.	Y - Signed subcontractor agreement.	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	8-06-2023	Email FROM relevant person	TSIC emailed TGS to provide them with draft correspondence and questionnaire TSIC propose to send to relevant fishers in the NW/King Island/Victorian region for their review. TSIC advised once the information is finalised, they will either email or post to relevant stakeholders followed by phone calls next week.	Y - Draft correspondence for fishers	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	8-06-2023	Email TO relevant person	TGS responded to TSIC's email received earlier that day thanking them for providing their information advising the information looks good and have provided a few suggestions for them to consider. TGS also provided the latest information sheet.	Y - Reviewed correspondence to fishers and information sheet	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	15-06-2023	Phone call TO relevant person	SLR called TSIC regarding their proposed marine seismic survey and assistance with meeting fishers on King Island Tasmania, however TSIC was not available. SLR left a message to advise of their call and they would email.	N	N/A	* (see note above table)	Continuing consultation.
Tasmanian Seafood Industry Council (TSIC)	15-06-2023	Email TO relevant person	SLR emailed TSIC regarding their proposed marine seismic survey and assistance with meeting fishers on King Island Tasmania, however TSIC was not available. SLR left a message to advise of their call and they would email.	N	N/A	* (see note above table)	Continuing consultation
TasPorts	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
TasPorts	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
TasPorts	24-04-2023	Email TO relevant person	TGS emailed TasPorts to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TasPorts to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
TasPorts	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
The Wilderness Society	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
The Wilderness Society	24-04-2023	Email TO relevant person	TGS emailed TWS to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TWS to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
The Wilderness Society	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism Industry Council of Tasmania	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tourism Industry Council of Tasmania	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism Industry Council of Tasmania	24-04-2023	Email TO relevant person	TGS emailed TICT to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TICT to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism Industry Council of Tasmania	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism SA	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tourism SA	16-05-2022	Email FROM relevant person	The email acknowledges that the South Australian Tourism Commission received the previous email advising them of the proposal to undertake the Otway Basin 3D Multi-client MSS and will give an initial response within 3-5 business days.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tourism SA	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism SA	15-02-2023	Email FROM relevant person	Automatic reply advising a response will be received within 3-5 business days.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tourism SA	24-04-2023	Email TO relevant person	TGS emailed TSA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked TSA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism SA	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Tourism Tasmania	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates - Maps of the Commonwealth fisheries that operate in the region	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	13-05-2022	Email TO relevant person	TGS state they are contacting ASBTIA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of the Commonwealth fisheries	N/A	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	31-05-2022	Email TO relevant person	TGS/Schlumberger invited Tuna Australia to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	29-06-2022	Meeting with relevant person	The stakeholder asked for clarification regarding whether the Otway Basin 3D MSS would be followed by additional seismic surveys over the same area over the next 5 years. TGS/Schlumberger/ERM explained that although these surveys are an alternative to companies undertaking their own proprietary 3D seismic surveys, the possibility of an oil and gas company undertaking a proprietary survey in the region can't be ruled out. TGS further clarified that the 3D survey would provide adequate data for clients to inform drilling campaigns. The stakeholder explained that Long-line fishing effort has historically taken place on the east coast of Australia, however, the long-line fisheries are likely to grow over time as the global and domestic SBT quotas increase; more effort is likely off the east coast of Tasmania and fishers will likely be looking for new grounds, which may include fishing further west off the Bass Strait off Victoria and southern SA. The stakeholder made note that Portland, Port Fairy and Warrnambool are significant staging areas for SBT recreational fishermen – up to 350-400 boats. TGS/Schlumberger confirmed they have sent stakeholder materials to the various State recreational fishing associations but have had no feedback to date. The stakeholder asked about the sensitivity of SBT to seismic emissions and potential for behavioural disturbance. ERM explained that the leading experts in the field of acoustics and fish suggest that the range to behavioural effects is likely to be in the order of hundreds of metres form the seismic source. The stakeholder asked about potential behavioural effects in bait fish, SBT prey. TGS/Schlumberger/ERM acknowledged that in some cases, the potential effects on baitfish could be greater than on SBT themselves. However, the impacts are typically short term and localised. The stakeholder asked if the seismic emissions could interfere with fish finders and echo-sounding devices. TGS/Schlumberger/ERM explained that they are not aware of any cases where the sound has interfered with higher frequency echo-sounders. TGS/Schlumberger highlighted that the intent is to keep engaging throughout the EP development process, after submission, and during the life of the EP (if accepted by NOPSEMA) as well.	N	Stakeholder has provided information and/or requested additional information. No objections or concerns were raised. Responses provided to stakeholder during call. Information regarding potential future changes in the long line fishery have been reflected in the EP.	* (see note above table)	No action required. Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tuna Australia (ETBF Industry Association)	01-07-2022	Email FROM relevant person	The stakeholder attached a consultation submission identifying the following impacts to fishing activity. 1. Possible food web impacts of large scale seismic testing regimes. Tuna Australia would like to ensure the impacts on bottom web species is included in any environmental before, after, control, impact, (BACI) assessment. 2. Potential impacts on the migratory routes of SBT should be considered in the context of not only the seismic testing area, but how it effects further movement east and north to the main catching areas off NSW over the following months. Tuna Australia would be grateful to understand if SBT migration will be considered in the broader environmental (BACI) assessment. 3. Seismic testing has proven detrimental to the fishing productivity of other fisheries sectors targeting demersal fish (Flathead and Whiting in the South East Trawl fishery for example) as well as invertebrates and shellfish. What assurances can TSG Schlumberger provide regarding these potential impacts and what compensation regimes are in place should this be proven to be a cause of decreased productivity, altered migratory routes or measured disruption to food web chain dynamics? 4. The proposal is silent on potential impacts on the electrical and acoustic interferences that may be generated through the proposed activities. Is there any evidence to suggest impacts may not be limited to fauna i.e. marine traffic? In addition, Tuna Australia remains concerned that many activities impact on our members statutory rights to access key fishing areas. For the activities identified in these proposals, the stakeholder would like to be assured that there will be no impact to target fish, or the broader ecology of the marine environment.	Y - Consultation submission from Tuna Australia - Professional fees invoice.	Stakeholder has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP. 1. Impacts to zooplankton, benthic invertebrates and baitfish are addressed in the underwater noise impact assessment in the EP. Impacts to zooplankton and benthic invertebrates are predicted to be minor in the context of natural mortality and variability. Zooplankton/invertebrates that are killed/injured continue to be scavenged within the water column or on the seabed. No significant food web impacts are expected. 2. Potential for activity to affect the migration of SBT is assessed in the EP. Given the limited sensitivity of tuna to sound pressure, behavioural effects will be localised. Evidence from previous studies, plus steady historical SBT catch rates in the GAB and Tasman Sea, indicate that SBT migration continues regardless of past seismic surveys. 3. Preliminary research reports regarding impacts of seismic in Bass Strait to whiting and flathead catches has been summarised in the EP. Note that exposure to shallow continental shelf species is not representative of deep water Otway Basin 3D MC MSS. Results of study are noteworthy and suggest longer term impact that broader body of research. Note, however, that historical catch of both species indicates that both impact and control sites were lowest on record and in decline prior to the survey. Past catches of deep water demersal slope species (including deep water flathead) in the GAB have returned to normal the month following a seismic survey in 2015 (Haddon 2017). 4. No known effects of low frequency seismic on high frequency sonar / fish finder devices, as stated during previous call. No effects on navigational equipment, noting proximity of seismic and support vessels to the seismic source. Statutory rights to access key fishing areas are acknowledged. Situation is complex for potential future long lining for SBT off Victoria given there have ben limited effort previously and difficult to predict exactly when/where effort will increase. Phases of survey are not expected to cover whole area and alternative fishing grounds will be available. TGS/SLB have developed a compensation protocol that covers damage to equipment, displacement, and associated reduced catch. No long term impacts to target tuna or broader ecosystem are expected. Regular reference made by client regarding before, after, control, impact, (BACI) assessment - Recommendation for research is noted. TGS/SLB support the notion of further research, however, currently TGS/SLB ability to fund research will depend upon survey funding / future joint industry funding opportunities and no specific studies are currently planned. EP will be assessed based on current available research and data.	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	05-07-2022	Email TO relevant person	TGS/Schlumberger thanked the stakeholder for providing a response and explained that they will now review this and reply in regards to any matters raised.	Y - Summary meeting notes from 29 June 2022	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	13-07-2022	Email TO relevant person	TGS noted that some information was missing from the stakeholders response letter and asked for clarification from the stakeholder on the months they request for the survey to take place to avoid impacts to fishers.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	14-07-2022	Email FROM relevant person	The stakeholder clarified that the months in which interaction with fishers would be minimised are April to December.	N	Stakeholder has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP. Requested period of avoidance has been assessed in the EP, but is not practicable, given other seasonal sensitivities that the survey must manage and that alternative fishing grounds will be available where long lining can continue.	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	09-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Invoice for professional fees	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	10-08-2022	Email TO relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference. TGS/Schlumberger explained that they are in the process of replying to the stakeholders submission from July 1st.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	16-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	18-08-2022	Email TO relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	21-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	23-08-2022	Email TO relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	24-08-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	25-08-2022	Email TO relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	13-09-2022	Email FROM relevant person	Confidential - Regarding commercial arrangements for consultation. Information is available in the Sensitive Matters Report for NOPSEMA reference.	Y - Tuna Australia Consulting Services Agreement	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	10-10-2022	Email TO relevant person	TGS/SLB provided a response to matters raised by the stakeholder previously. TGS/SLB provided a summary of potential impacts to southern bluefin tuna (SBT) and other fishes in the EP. Key points are provided below. 1. Food web impacts (plankton and baitfish) 2. Disturbance to SBT migration 3. Impacts to fishing productivity 4. Electrical and acoustic interferences TGS/SLB provided reference to key controls that will lbe implemented in the EP. TGS/SLB also confirmed that Before, After, Control, Impact, (BACI) assessments will not be applied in the EP assessment but may be considered further. TGS/SL informed the stakeholder they will let them know the Otway Basin 3D MC MSS EP is available for the public comment period and direct them to the relevant impact assessment sections.	Y - Consultation submission from Tuna Australia	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	2-11-2022	Email TO relevant person	TGS acknowledged TA's reply to previous email and advised their legal team is currently reviewing the service agreement. TGS said they would be in touch soon.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	2-11-2022	Email FROM relevant person	TA acknowledged previous email from TGS and thanked them for the EP. TA said they would need further clarification and justification of the information but expressed their willingness TGS with meeting EP requirements, however must be done under service agreement.	Y - Service Agreement	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	4-11-2022	Email TO relevant person	TGS emailed TA to advise that in order for them to progress their service agreement, they require TA to complete a Due Diligence Questionnaire.	Y - Due Diligence Questionnaire	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	16-11-2022	Email FROM relevant person	TA provided completed Due Diligence Questionnaire.	Y - Due Diligence Questionnaire	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	22-11-2022	Email TO relevant person	TGS provided TA with reviewed service agreement for their review.	Y - Reviewed service agreement	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	13-02-2023	Email TO relevant person	TGS provided TA with updated information sheet and asked for any feedback. TGS also asked about whether they'd reviewed the service agreement comments that TGS provided last Nov.	Y - Updated informtion sheet	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	15-02-2023	Email TO relevant person	TGS replied to previous email from TA advising them to execute agreement and feedback is due back by 16/03/2023.	N	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	15-02-2023	Email FROM relevant person	TA reply emailed previous email from TGS asking whether they reviewed the service agreement comments. TA apologised for not having returned the agreement and included in this email. TA stated they have no concerns with what is proposed in the agreement and accepted all changes. TA asked if there was nothing further to let them know so they can execute the agreement. TA also advised they would respond regarding the new EP area and asked for a response due date.	Y - service agreement	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	28-02-2023	Email FROM relevant person	TA apologised for the delay as they were out at sea last week. TA provided the latest version of the services agreement executed their end and advised them to call if TGS require anything further.	Y - Tuna Australia Consulting Services Agreement	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	2-03-2023	Email TO relevant person	TGS provided TA with a copy of the fully executed agreement and advised TA they are looking forward to receiving their feedback on the revised Otway 3D area.	Y - Tuna Australia Consulting Services Agreement	N/A	* (see note above table)	Continuing consultation.
Tuna Australia (ETBF Industry Association)	14-03-2023	Email FROM relevant person	TA emailed TGS to ask for an extension in time for providing feedback as they are still waiting for feedback from members and a few issues have been raised that require more research and thought. TA asked if they could submit their report on 24/03/2023 and asked for TGS to confirm this would be ok.	N	Continuing consultation	* (see note above table)	Continuing consultation
Tuna Australia (ETBF Industry Association)	15-03-2023	Email TO relevant person	TGS replied to TA's previous email requested extension of time for submitting feedback and advised the 24 March will be fine and advised them TA to let TGS know if they need more information. TGS concluded email by stating they look forward to hearing from them.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Tuna Australia (ETBF Industry Association)	30-03-2023	Email FROM relevant person	TA emailed TGS to provide them with a formal submission for the Otway Basin 3D Marine Seismic Survey EP and appreciated their patience while they consulted with industry. TA closed the email offering to call them if TGS requires further information. The TA submission included the following summarised information: - background information about the existing tuna fisheries in Australia (distribution, management and commercial catch); - current activity; - impacts of marine seismic survey on fishing activity (food web impacts and SBT migratory pattern interruption); - concession holders in multiple fisheries (lobsters and king crab and nursery stage of some SESSF species claimed to aggregate in the Zeehan marine park area); and - competing marine seismic surveys (CGG survey appears to occur at the same time - duplication of activity and cumulative impacts). Refer to Appendix H for detailed submission.	Y - formal submission	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Impacts of marine seismic survey on fishing activities: **Section 7.1.3.1 (**impacts of the physical presence of the seismic survey vessels), **Section 7.2.3.1** (imapcts of acoustic disturbacne on fisheries), **Section 8.2.3** (imapct of streamer loss), **Section 8.3.4.1 (**hydrocarbon spill), and Table 84 includes control measures for adressing commercial fishers compensation in accordance with agreed protocols. Cumulative impacts: **Section 9** sets of the approach and framework for assesment of cumualtive effects, which TGS are concurrently engaging with current operators and title holders to ensure the application of a meaningful proces to acknowledge and account for data gaps in cumualtive mapct assesment is adressed. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Tuna Australia (ETBF Industry Association)	14-04-2023	Email TO relevant person	TGS replied to TA's email received 30/03/2023 thanking them for their submission stating it is great to get feedback from the industry on three tuna fisheries. TGS advised their feedback will be taken in to consideration as the EP and control measures are being developed. TGS also noted the following summary: - TGS is working with SETFIA to understand the fishing activity in and around the survey area and assist with notifying fishers during the survey. - TGS is committed to working with commercial fishers and trying to minimise any potential impacts or concerns. - A commercial fisheries adjustment protocol will be in place (this can be provided once finalised). - The operational area is in deep water where most of the survey will be acquired in water depths > 500 m to 5,000 m. - There will be restrictions around blue whale biological important areas, limiting where the vessel can operate during Jan - April to avoid impacts on feeding pygmy blue whales, which also coincides with the information TA provided on SBT from all western Victorian ports and the Bass Strait between Feb - March. - There should be on nearshore fisheries or migrations due to the physical distance separation with the SBT areas and area where the seismic vessel will be operating with an active source. - There will be marine fauna observers onboard the survey vessel and support vessel(s) that will record any sightings of SBT and this information will be shared with TA. - In agreeance with TSIC, the survey will exclude any activity in waters less < 1,000 m depth on the eastern side of the operational area to avoid any impacts with giant crab fishery, which also removes the survey from areas where tuna fishing has been undertaken in the past. - TGS is aware of the Regia survey proposed by CGG and is in discussions with them about potential cumulative impacts in the area. It is unlikely the surveys will take place concurrently. TGS closed the email by inviting TA to let them know if they have any further questions or concerns. Refer to Appendix H for detailed submission.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	15-02-2023	Email FROM relevant person	Automated reply advising correspondence had been received with Case ID [reference included] and UTAS will be in contact in due course, advising TGS may provide updates by responding to this email.	N	Continuing consultation	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	16-03-2023	Email FROM relevant person	IMAS emailed TGS to provide comment on the upcoming survey. Key comments summarised below: - given survey predominantly in deep water (excluding tie-in component), potential impacts to animals are likely not going to be directed to animals on benthos. - given high productivity in region to be surveyed, there is potential for impacts to zooplankton. - their research team presented evidence in 2017 that seismic surveys can cause significant mortality to zooplankton populations, decreasing zooplankton abundance when compared with controls and caused a two- to threefold increase in dead adult and larval zooplankton. - impacts were observed to a maximum range of 1.2 km. - no adult krill were present, however all larval krill were killed after airgun passage. - this study highlighted the significant and unacknowledged potential for ocean ecosystem function and productivity to be negatively impacted by present seismic technology. Further comments were made about previous research. IMAS concluded their message by stating that given the potential for the planned survey to impact the planktonic community in the survey region and consequential impacts on the ecosystem, IMAS has an expectation that TGS will address the potential risk in their EP. IMAS also stated that given the general lack of understanding of seismic survey impact on plankton and the large-scale of the planned activity in a highly productive system, they encourage TGS to fund a scientific study to run parallel with the proposed survey. IMAS requested TGS contact them to discuss the above matters further.	N	The relevant person has raised an objection, claim or concern. The objection or claim raised is considered to have no merit.	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	17-03-2023	Email TO relevant person	TGS acknowledged IMAS' email sent 16/03/2023 and their feedback and advised they would appreciate a meeting to discuss comments further. TGS asked IMAS for a suitable meeting date and time and preferred meeting platform. TGS also thanked IMAS for their time and look forward to hearing from them soon.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	21-03-2023	Email FROM relevant person	IMAS replied to email TGS sent on 17/03/2023 apologising for late reply and asked if either Monday or Wednesday next week would suit for a meeting and said either Zoom or Teams would be fine.	N	Continuing consultation	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	22-03-2023	Email TO relevant person	TGS emailed IMAS to ask them to let them know when is convenient to meet and TGS can arrange an online meeting to discuss.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	22-03-2023	Email TO relevant person	TGS replied to IMAS' email from earlier in the day suggesting a date and time for a meeting. TGS apologised for the delay in replying and confirmed Wednesday would work and advised they would set up an online meeting with Teams for 11 am Perth time/2 pm Tasmania time.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	22-03-2023	Email TO relevant person	TGS sent meeting invite to IMAS for meeting on 29/03/2023 at 4:00 pm (NZT) via Microsoft Teams.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	22-03-2023	Email FROM relevant person	IMAS replied email to advise they were resending as did not appear as though TGS received last email with suggested meeting time and date. IMAS asked if either Monday or Wednesday next week would suit for a meeting.	N	Continuing consultation	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	23-03-2023	Email FROM relevant person	IMAS replied to email TGS sent on 22/02/2023 confirming the meeting time of 11 am Perth time/2 pm Tasmania time for next Wednesday.	N	Continuing consultation	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	29-03-2023	Meeting with relevant person	TGS, SLB and SLR met with UTAS to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with UTAS: - Blue whale season. - Range [distance] and propagation of acoustic sound. - Fuel oil and spill modelling. - Impacts to plankton, e.g. krill, threshold distances. - Influence of prey on whale presence, impacts on whales and control measures. - Giant crab exclusion zone near King Island. - Potential for research program associated with the survey > currently limited information impacts on plankton. - Limitations on their 2017 study. Meeting closed with TGS inviting UTAS to provide a proposal for research. Refer to Appendix I for a copy of the full meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	29-03-2023	Email FROM relevant person	IMAS emailed TGS to provide them with the scientific references as discussed at the meeting held earlier that day with specific reference to the Pygmy Blue whale season.	Y - Scientific references	Continuing consultation	* (see note above table)	Continuing consultation
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	30-03-2023	Email TO relevant person	TGS replied to IMAS' email from the previous day thanking them for sending the references as discussed at the meeting held the previous day. TGS advised they are working on the minutes and hope to get them to IMAS early next week for their review.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	30-03-2023	Email TO relevant person	SLR replied to IMAS thanking them for sending the scientific references through to them the previous day. SLR advised they have discussed the 2018 McCauley et al. within the EP already, however had not used Garilov 2018. SLR advised they will review the scientific references IMAS provided and mentioned they had primarily relied on work by another scientist [SLR has been liaising with] and other literature detailed in the EP for defining the foraging season. SLR closed the email by thanking IMAS again.	N	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	13-04-2023	Email TO relevant person	TGS emailed IMAS providing the minutes from meeting held on 29/03/2023 for their record and review. The minutes also included a copy of the slides presented at the meeting. TGS also attached the latest copy of the underwater acoustic modelling report prepared by JASCO. TGS closed the email by advising recipients to get in touch if there area any amendments or queries.	Y - meeting minutes, presentation and acoustic modelling report references.	N/A	* (see note above table)	Continuing consultation.
University of Tasmania (UTAS) - Institute for Marine and Antarctic Studies (IMAS)	16-06-2023	Email FROM relevant person	UTAS emailed TGS to provide them a proposal for potential plankton research project consisting of two components (details provided in correspondence). UTAS closed the email asking whether TGS and UTAS should meet to discuss further and said they would like an update from TGS on their EP process also.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Victorian Fisheries Authority (VFA) - Fisheries Management and Science Branch	12-05-2022	Email TO relevant person	TGS state they are contacting VFA to provide information on the Otway Basin 3D Multi-client (MC) Marine Seismic Survey (MSS), which TGS and Schlumberger propose to undertake in Commonwealth waters offshore from Victoria, Tasmania and South Australia.	Y - Area coordinates, information sheet and maps and a summary of three Victorian fisheries	N/A	* (see note above table)	Continuing consultation
Victorian Fisheries Authority (VFA) - Fisheries Management and Science Branch	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	15-02-2023	Email FROM relevant person	Replied to TGS previous email advising they will respond when working.	N	Continuing consultation	* (see note above table)	Continuing consultation
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	24-04-2023	Email TO relevant person	TGS emailed VFA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked VFA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	24-04-2023	Email FROM relevant person	VFA included TGS within a forwarded email to another two contacts within their department asking if they had any comments.	N	Continuing consultation	* (see note above table)	Continuing consultation
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	26-04-2023	Email FROM relevant person	VFA replied to TGS' email sent 24/04/2023 apologising for delayed response and advised they are liaising with other VFA staff and will let TGS know as soon as possible.	N	Continuing consultation	* (see note above table)	Continuing consultation
Victorian Fisheries Authority (VFA) - Ocean General Fishery Manager	28-04-2023	Email TO relevant person	TGS replied to VFA's email received 26/04/2023 acknowledging their response. TGS asked VFA if it would be easier to discuss as can provide an online presentation with an opportunity to discuss any queries they have at the end. TGS added they really want to make sure they area liaising with the relevant Victorian fisheries rather than overload other fisheries unnecessarily and after some advice on the best way to do that. TGS closed their email saying they would appreciate any help.	N	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Rock Lobster and Giant Crab Fishery Manager	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Rock Lobster and Giant Crab Fishery Manager - Ocean General Fishery Manager - Fisheries Management and Science Branch	11-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Potential for Interaction with Victorian Fisheries Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Victorian Fisheries Authority (VFA) - Rock Lobster and Giant Crab Fishery Manager - Ocean General Fishery Manager - Fisheries Management and Science Branch	11-05-2022	Email FROM relevant person	Emails undeliverable to two stakeholder email accounts. Note, other VFA contacts (fishery managers) were successfully emailed.	N	Continuing consultation	* (see note above table)	Continuing consultation
Visit Victoria	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Visit Victoria	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Visit Victoria	24-04-2023	Email TO relevant person	TGS emailed VV to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked VV to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Visit Victoria	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Visit Victoria	22-05-2023	Email FROM relevant person	VV replied to TGS' email sent earlier that day advising they have forwarded to the relevant internal stakeholders and suggested contacting the Commissioner for Environmental Sustainability Victoria (link to website provided).	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
VR Fish (Victorian Rec Fishing Peak Body)	16-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
VR Fish (Victorian Rec Fishing Peak Body)	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
VR Fish (Victorian Rec Fishing Peak Body)	15-02-2023	Email TO relevant person	Forwarded email TGS sent the day before to ensure they received the email as there were IT issues where VR Fish may not have been able to reply. TGS closed their email asking for all comments and replies to be provided to TGS by 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	14-03-2023	Phone call TO relevant person	TGS called WTOAC to follow up on email and factsheet sent 16/02/2023. WTOAC advised that no one from Heritage was currently in the office and took TGS' contact details. The WTOAC representative advised they were new and wasn't sure whom the right contact was but they would find out and someone would get back in touch.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	22-03-2023	Email TO relevant person	TGS emailed WTOAC to provide them with an updated version of the factsheet which is more concise and provides an explanation of why TGS is wanting to consult with WTOAC on their planned project. TGS continued the factsheet explains what a marine survey is, what are the potential effects on the environment, the measures TGS has in place to limit the potential effects and safeguards in place should an unexpected event occur. TGS said they would like to meet WTOAC online to share TGS's plans and whether WTOAC has any concerns and can arrange an online meeting at their convenience to discuss. TGS closed the email by thanking WTOAC and advising they look forward to hearing from them.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	27-03-2023	Phone call TO relevant person	TGS called WTOAC to follow up on email and factsheet sent 22/03/2023. WTOAC reception provided TGS with contact details of a suitable WTOAC member to speak to and TGS called that member. WTOAC advised they didn't think there would be any concerns as it is so far offshore, however would be worth meeting. WTOAC advised they would send a meeting request form for TGS to fill in.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	27-03-2023	Email FROM relevant person	WTOAC emailed TGS to provide them with contact details for the WTOAC person whom can send a meeting booking form to schedule a time with the Heritage Unit to discuss the project.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	27-03-2023	Email TO relevant person	TGS emailed WTOAC to provide them with a completed meeting booking request form.	Y - Completed meeting booking request form	N/A	* (see note above table)	Continuing consultation.
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	27-03-2023	Email FROM relevant person	WTOAC emailed TGS to provide them with a meeting booking request form for TGS to complete and submit to book a meeting to discuss the proposed marine seismic survey.	Y - Meeting booking request form	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	27-03-2023	Email FROM relevant person	WTOAC acknowledged TGS' email sent earlier in the day providing the completed meeting booking request form and advised the next available meeting would be 27/06/2023 at 1300 hrs.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	3-04-2023	Phone call TO relevant person	TGS called WTOAC to ask if possible to have an earlier meeting (currently proposed for 27/06/2023) given they thought there would be no concerns. WTOAC advised they wouldn't be able to meet earlier because they are busy but it still stands they think there will be no concerns but they can't provide this in writing as they are required to meet with their members and they didn't have time now. TGS thanked them for their time.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	3-04-2023	Email TO relevant person	TGS emailed WTOAC to confirm meeting booking scheduled for 27/06/2023 at 13:00 hrs and asked if they would send an invitation or would they like TGS to send one.	N	N/A	* (see note above table)	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	3-04-2023	Email FROM relevant person	WTOAC replied to TGS' email earlier in the day confirming meeting booking in June and advised they have sent a meeting invite.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	3-04-2023	Email FROM relevant person	WTOAC sent TGS a meeting invite for 26/07/2023 at 1300 hrs, using Microsoft Teams.	Y - Meeting booking request form	Continuing consultation	* (see note above table)	Continuing consultation
Wagonga Local Aboriginal Land Council	12-04-2023	Email TO relevant person	TGS emailed WLALC to advise of their proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback by 19/04/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Wagonga Local Aboriginal Land Council	12-04-2023	Email FROM relevant person	Automated email from WLALC advising a problem with the recipient's mailbox, and to try resending.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wagonga Local Aboriginal Land Council	12-04-2023	Email FROM relevant person	TGS resent the email sent to WLALC that was undelivered earlier that day, however received notification this email was also undelivered.	Y - Copy of previously undelivered email	Continuing consultation	* (see note above table)	Continuing consultation
Wagonga Local Aboriginal Land Council	1-05-2023	Letter to relevant person	TGS posted a registered letter to WLALC advising of TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS enclosed an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 12/05/2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Wagonga Local Aboriginal Land Council	9-05-2023	Email TO relevant person	TGS emailed WLALC seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from WLALC to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked WLALC to reply and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Wagonga Local Aboriginal Land Council	22-05-2023	Email TO relevant person	TGS emailed WLALC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous correspondence. TGS asked if WLALC has any input about the survey to let them know prior to 26/05/2023 so they can consider the information within the development of their environment plan before submitting to NOPSEMA for their review. TGS closed the email asking them to reply to the email if they have any queries or would like further details.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Wagonga Local Aboriginal Land Council	1-06-2023	Email TO relevant person	TGS emailed WLALC advising NOPSEMA has advised they should provide a copy of the attached brochure to help relevant persons provide feedback on the proposed survey, explaining their rights and TGS' obligations through the consultation process. TGS asked WLALC to advise if they have any queries about their consultation program so they can make sure WLALC can actively participate in the process. TGS advised they are about to submit their environmental plan (EP) to NOPSEMA for their completeness check and once accepted as complete will release their EP for public consultation where WLALC has the opportunity to reveiw the draft EP and provide feedback before TGS resubmit to NOPSEMA for their overall assessment. TGS closed the email asking WLALC to call or email if they have any questions or would like additional information. Alternatively to advise if they wish to be removed from the consultation program and TGS will stop sending them communications.	Y - NOPSEMA consultation guideline	N/A	* (see note above table)	Continuing consultation.
Waratah-Wynyard Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Waratah-Wynyard Council	24-04-2023	Email TO relevant person	TGS emailed WWC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WWC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	16-02-2023	Email FROM relevant person	Automated email acknowledging TGS email has been received and registered within their records system and will be forwarded to the appropriate department for action.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	4-03-2023	Email TO relevant person	TGS replied to WCC's email regarding setting up a meeting with executives and councillors to breif them on the proposed marine seismic survey within the Otway Basin. TGS suggested 17/04/2023.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	3-04-2023	Email FROM relevant person	WCC responded to the email TGS sent out 16/02/2023 regarding their proposed marine seismic survey in the Otway Basin. WCC thanked TGS for the offer to engage and would like to invite TGS to a briefing with their executives and councillors with a focus on what is being proposed, approval process and timelines along with any impact assessment/environmental assessment that TGS is able to share. WCC advised their briefing sessions are held on Monday afternoons and asked TGS to let them know a suitable date when they can attend and they can schedule it in.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	6-04-2023	Email TO relevant person	TGS emailed WCC to ask if they could let them know if 17/04/2023 will be suitable for a meeting and whether they can attend via an online meeting.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	12-04-2023	Email TO relevant person	TGS emailed WCC following up email sent 03/04/2023 about confirming meeting for 17/04/2023.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	13-04-2023	Email TO relevant person	TGS thanked WCC for their email received 13/04/2023.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	13-04-2023	Email FROM relevant person	WCC replied to email TGS sent 12/04/2023 about confirming a meeting date and time, apologising. WCC needs to discuss with management how consultation will work and is meeting with them morning of 14/04/2023 to discuss and hopefully have an answer tomorrow afternoon.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	14-04-2023	Email FROM relevant person	WGG emailed TGS to advise WCC had discussed consultation on the Otway Basin 3D Marine Seismic Survey and aren't ready to conduct anything with the councillors and executive management team at this time. WCC advised if possible they would like to do something in the next few months and will be in contact again shortly.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	17-04-2023	Email TO relevant person	TGS emailed WCC thanking them for their reply of 14/04/2023. TGS asked if there was anything they can provide WCC to ensure they've got sufficient information to know if the survey impacts Council's functions, interests or activities. TGS advised they have been liaising with local groups and are aware of some of the local issues and may be able to provide an insight in to what measures they will have in place to address them. TGS continued a meeting might help streamline information for the Councillors and Executive Management when time comes to meet with them and would help TGS with identifying other issues they may need to address during their survey planning and within their environmental plan. TGS closed the email by advising they had attached the updated information sheet and were happy to arrange an online meeting that suits them over the next week or two.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	17-04-2023	Email FROM relevant person	Automated reply advising the WCC contact was on leave returning to the office on 24/04/2023 and will respond to this email on their return.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	26-04-2023	Email TO relevant person	TGS emailed WCC to follow up on email sent to WCC on 17/04/2023 and if there was anything TGS could help WCC with.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	26-04-2023	Email FROM relevant person	WCC replied to email TGS sent earlier that day asking if TGS would be available on 22/05/2023 to present to their councillors and if so, WCC can provide information on available times.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	27-04-2023	Email TO relevant person	TGS replied to WCC's email received yesterday suggesting a meeting date. TGS confirmed they would like to meet with WCC's Councillors on 22/05/2023 and to please send through available times. TGS closed the email asking if there were any specific questions or information the Councillors or council staff had so that TGS could include in their presentation.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	3-05-2023	Email FROM relevant person	WCC replied to TGS' email sent 27/04/2023 confirming TGS' presentation would be part of their councillor briefing session on Monday afternoon. WCC continued this would be a 10 min allocated time confirmed closer to the date and advised the presentation could be in person or online and presentation facilities are available. WCC said they can add the information sheet provided to them earlier, to their breifing paper. WCC advised it would be good for TGS to provide a summary of what works are intented, expected outcomes and issues to deal with.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	12-05-2023	Email TO relevant person	TGS emailed WCC to thank them for setting up the meeting on 22/05/2023 and asked if they had a time slot that TGS will be presenting.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	15-05-2023	Email FROM relevant person	WCC emailed TGS advising they don't have a time slot for their meeting on 22/05/2023 yet but will advise as soon as they find out.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	18-05-2023	Email FROM relevant person	WCC emailed TGS to apologise and advise they have to reschedule their meeting from 22/05/2023 to either 19 or 26/06/2023 (following month) and asked which date TGS would prefer, reminding TGS they can do online if not available in person.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	19-05-2023	Email TO relevant person	TGS emailed WCC thanking them for their reply of 18/05/2023. TGS confirmed a meeting for 19/06/2023 and explained they will be submitting their environmental plan to NOPSEMA for completeness check before they can meet with council however they are visiting the area soon if they'd like to meet. TGS continued this would provide an opportunity to share feedback for survey planning and their environmental plan. TGS closed the email asking if they would like to catch up and TGS can confirm a time.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	23-05-2023	Phone call TO relevant person	TGS called WCC to follow up on email sent 19/05/2023 regarding a meeting while TGS visits Victoria, however there was no answer. TGS left a message to return their call.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Warrnambool City Council	24-05-2023	Email FROM relevant person	WCC replied to TGS' email sent 19/05/2023 advising they are happy to leave the meeting until 19/06/2023.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	25-05-2023	Email TO relevant person	TGS replied to WCC's email received the day before. TGS asked if WCC had any information they woud like TGS to consider or address within their survey planning for their initial environmental plan submission to NOPSEMA. TGS said they are asking for all information to be provided before 31/05/2023 but advised WCC to let them know if they need more time and to contact them if any queries arise in the meantime.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	7-06-2023	Email TO relevant person	TGS replied to WCC's email from earlier that day and confirmed the people attending the Council briefing and that the meeting will be online.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	7-06-2023	Email FROM relevant person	WCC emailed TGS to confirm who will be attending the council briefing scheduled for 19/06/2023 and whether their attendance will be in-person or online.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	7-06-2023	Email FROM relevant person	WCC replied to TGS' email reply sent earlier that day thanking TGS.	N	Continuing consultation	* (see note above table)	Continuing consultation
Warrnambool City Council	13-06-2023	Email FROM relevant person	WCC emailed TGS confirming the presentation to council 19/06/2023 will still work for TGS.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	13-06-2023	Email TO relevant person	TGS replied to WCC's email received earlier that day confirming the meeting time and date will work for TGS and asked if WCC would be sending out a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	14-06-2023	Email FROM relevant person	WCC replied to TGS' email sent the day before advising the WCC admin team will be in contact with a meeting link.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	14-06-2023	Email TO relevant person	TGS' replied to WCC's email received earlier that day thanking them.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	15-06-2023	Email FROM relevant person	WCC emailed TGS asking for meeting attendees email address for meeting scheduled 19/06/2023 to send a meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	15-06-2023	Email TO relevant person	TGS replied to WCC's email providing them email addresses for meeting attendess for 19/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	15-06-2023	Email FROM relevant person	WCC emailed a meeting invite for 19/06/2023.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool City Council	15-06-2023	Email TO relevant person	TGS replied to WCC's email thanking them for sending meeting invite.	N	N/A	* (see note above table)	Continuing consultation.
Warrnambool Coastcare Landcare Network Inc	20-03-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 27/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool Coastcare Landcare Network Inc	24-04-2023	Email TO relevant person	TGS emailed WCLN to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WCLN to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool Coastcare Landcare Network Inc	22-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Warrnambool Coastcare Landcare Network Inc	10-06-2023	Email FROM relevant person	WCLNI replied to TGS' email sent 22/05/2023 and provided a formal response regarding their proposed marine seismic survey. WCLNI discussed TGS' information and advised that WCLNI has decided that seismic [surveying] should not proceed in the Otway Basin or any areas where the marine environment will be impacted, adding if a different and less hazardous technique for marine exploration is proposed they will be pleased to consider it. WCLNI provided the following summarised reasons in their submission: - direct impact on little penguin feeding and breeding; - general impact on marine animals (negative effects of seismic sound, particularly impacts to commercial fishing catches); - general impact on cetaceans (reduced sightings), particularly seismic survey noise; - impact on the foundations of marine food web (impacts to plankton, larval stages of many commercial fisheries); and - any processes that drive marine life away from Bonney Upwelling as a critical food source should be prevented. Refer to Appendix H for detailed meeting minutes.	Y - Formal submission	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Effects to little penguin feeding and breeding: Section 7.2.2.3.7 (effects of acoustic disturbance on Seabirds, including penguins), Section 8.3.3.2.6 (effects of hydrocarbon spill / oiling to Seabirds and Migratory Shorebirds including penguins). General impact on marine animals (effects of acoustic disturbance, including commercial fisheries): Section 7.1.3.1 (Seismic Survey physical presence: Potential Impacts and Risks to Commercial Fishing Operations), Section 7.2.3.1 (Acoustic disturbance - Evaluation of Known and Potential Impacts and Risks on Commercial Fisheries), Section 8.2.3 (Streamer loss - Evaluation of Known and Potential Impacts and Risks to Other Marine Users), Section 8.3.4.1 (Hydrocarbon spill - Potential Impacts and Risks to Commercial Fishing). General impact on cetaceans: Sections 7.2.2.3.6 and 7.2.2.4.2 (Acoustic imapcts to marine mammals with control measures specific for marine mammals listed in Table 84), and Section 8.3.3.2.5 (effects of a hydrocarbon spill to marine mammals). Impact plankton, larval stages of many commercial fisheries): Section 7.2.2.3.2 (bony fish / tuna behavioural impacts), and Section 7.2.2.2.1.2 (duration and extent of zooplankton exposure), and Section 7.2.2.2.3.2 (bony fish larvae). Interactions and cumulative effects: Table 84 lists control measures to require a SIMOPS plan, which includes the implementation of a 40 km spatial separation between Seismic Vessels. Section 9 sets out the approach to managing Cumulative Impacts. Outcomes of concurrent Cumulative Imapct Assessment workshops will be incorporated as frameworks become finalised and available for incorporation into this EP. Ongoing consultation with WCLNI will be undertaken in accordance with the methods set out in **Section 5** to ensure WCLNI have had both sufficient information, and sufficient time to engage in the consultation programme. TGS will continue to consult with WCLNI and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.
Weetapoona Aboriginal Corporation	20-04-2023	Phone call FROM relevant person	WAC called TGS following TGS' email sent earlier that day. WAC confirmed consultation was more relevant to them than SETAC (health care provider) and would be better to send to the Weetapoona Board (email provided). WAC advised they would respond if relevant. TGS noted they have been working on kelp rehabilitation.	N	The relevant person has provided information and/or requested additional information. No objections or concerns were raised.	* (see note above table)	No action required. Continuing consultation.
Weetapoona Aboriginal Corporation	20-04-2023	Email TO relevant person	TGS emailed WAC to advise of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 4 May 2023.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	26-04-2023	Phone call TO relevant person	TGS called WAC but there was no answer. TGS left a message advising they will be in Tasmania next week and would welcome a meeting and to please call TGS back to discuss.	N	Continuing consultation	* (see note above table)	Continuing consultation
Weetapoona Aboriginal Corporation	28-04-2023	Email TO relevant person	TGS emailed WAC following phone call earlier that day. TGS mentioned they will be in Hobart next week and would welcome the opportunity to give a project overview and to hear if WAC or anyone else in their organisation has any concerns or questions about the proposed Otway offshore seismic survey. TGS suggested any time Friday or Thursday afternoon would work. TGS closed the email stating they look forward to meeting with them next week.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	1-05-2023	Email FROM relevant person	WAC replied to TGS' email sent 28/04/2023 regarding a possible meeting with WAC.advising TGS may be better to engage with Australia mainland Aboriginal organisations as much closer to them than WAC and asked what TGS' thoughts were.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	1-05-2023	Email TO relevant person	TGS replied to WAC's email received earlier that day advising they are engaging with other groups about their proposed marine seismic surey and would like to engage with all groups to ensure they understand any concerns the different groups may have.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	3-05-2023	Email FROM relevant person	WAC emailed TGS to advise they have sent an email to see if anyone is available for a meeting and will advise as soon as they know.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	3-05-2023	Email TO relevant person	TGS replied to WAC's email received earlier that day advising they can meet online next week if a meeting this week is not suitable.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS emailed WAC to arrange a meeting to discuss their proposed marine seismic survey suggesting 11/05/2023. TGS advised they can send a Teams invite to forward on [to others that may wish to attend].	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	9-05-2023	Email FROM relevant person	WAC replied to TGS' email sent earlier that day requesting a meeting to discuss their proposed marine seismic survey and asked TGS to let them know whent and WAC will send an invite to the cultural committee.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS replied to WAC's email received earlier that day suggesting 11/05/2023 for an online meeting to discuss their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	9-05-2023	Email TO relevant person	TGS emailed WAC a meeting invite for 11/05/2023 to discuss their proposed marine seismic survey.	N	N/A	* (see note above table)	Continuing consultation.
Weetapoona Aboriginal Corporation	11-05-2023	Meeting with relevant person	TGS, SLB and SLR met with WAC/SETAC to discuss their proposed marine seismic survey within the Otway Basin. TGS and SLR delivered a presentation providing an overview of the project and environmental planning to develop the environmental plan before discussing the following summarised queries with WAC/SETAC: - Fuel release and response process; - Reason for survey - to provide data to oil and gas companies, not a government initiative. - Impacts to marine life, cultural sites (petroglyph sites), heritage sites (Tasmanian Wilderness Heritage area) and fishing trap areas. - TGS part of the Energeo Alliance Ghost Net and Marine Debris Removal Iniative. - Socio-economic benefits of the project - employment opportunities etc. - Oil and gas exploration and drilling is not in the scope of this project, just data acquisition. Refer to Appendix I for detailed meeting minutes.	N	The relevant person has raised an objection, claim or concern. The objection or claim has merit and is addressed in the EP.	Specific aspects of the discussion points are adressed in the following sections: Fuel release and response process: **Section 10.9 (OPEP)** Impacts to culture and heritage, as well as socio-economic imapcts are disscussed in detail in **Section 7.1.3** (Physical presence), **Section 7.2.3** (Acoustic imapcts), **Section 8.1.3** (Unplanned activities), **Section 8.3.4** (hydrocarbon spill) Impacts to marine life: **Section 7.2.2** (acoustic impacts), **Section 7.2.3** (routine permissible waste discharges), **Section 7.4.2** (atmospheric emissions), **Section 7.5.2** (artificial light emissions), **Section 8.1.2** (IMS), **Section 8.2.2** (streamer loss), **Section 8.3.3** (vessel collision and hydrocarbon spill), **Section 8.5.2** (accidental release of hazardous and non-hazardous materials). Other aspects regarding use of data in relation to the Oil and Gas Industry are outside the scope of the NOPSEMA regulations for the purpose of this EP. Remaining concerns will be subject to ongoing consultation. TGS will continue to consult and endeavour to provide assurances of its environmental protection measures for its projects.	Continuing consultation.

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Weetapoona Aboriginal Corporation	9-06-2023	Email TO relevant person	TGS emailed WAC to provide them with a copy of the meeting minutes and presentation for their review and record. TGS asked WAC to advise of any changes and provided the following information as discussed during the meeting: - contact for Aboriginal Heritage Tasmania; - information about the Energeo Alliance - Ghost net and marine debris removal initiative, including information about handling entangled animals (attached); and - employment opportunities (marine fauna observer possibility), asking WAC to advise if there would be interest so they can discuss further. - TGS thanked WAC for their time and information and advised they have noted their concerns and queries which will be incorporated within their enviornmental and survey planning and environmental plan. TGS closed by advising they will keep them updated as things progress and get the impact summaries as soon as they can but asked them to get in touch if they have any amendments or queries.	Y - Meeting minutes, copy of presentation and IAGC guidance for handling entangled animals.	N/A	* (see note above table)	Continuing consultation.
Wellington Shire Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wellington Shire Council	16-02-2023	Email FROM relevant person	Automated email advising email has been received and will be handled and responded to in accordance with Customer Service Commitment.		Continuing consultation	* (see note above table)	Continuing consultation
Wellington Shire Council	24-04-2023	Email TO relevant person	TGS emailed WSC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WSC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wellington Shire Council	24-04-2023	Email FROM relevant person	Automated email responding to email TGS sent earlier in the day acknowledging email.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wellington Shire Council	4-05-2023	Phone call TO relevant person	SLB called WSC and explained the call was to ask for feedback on the marine seismic survey proposed for the Otway Basin that TGS recently emailed the council including an information sheet. The Council representative confirmed the email and factsheet had been received and reviewed but their records showed receipt was still within 10 days for them to respond. WSC advised someone would reply to TGS by 08/05/2023 and if to please call again.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wellington Shire Council	10-05-2023	Phone call TO relevant person	TGS called WSC following email TGS sent 24/04/2023 regarding their marine seismic survey proposed for the Otway Basin. WSC confirmed they had received the information and advised the person looking after this query and they will ask that person to call TGS back as they were not available at the moment.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wellington Shire Council	10-05-2023	Email FROM relevant person	WSC emailed following TGS' phone call made earlier that day. WSC advised they tried calling the phone number provided by their message taker but must have been recorded incorrectly, hence their email. WSC apologised for their late response but given the proposed location of the seismic survey work, which they understand is within the Otway Basin and remote proximity to Wellington Shire, they don't believe it will impact the activities of the council. WSC closed their email by thanking TGS for their communication and opportunity to comment and wish TGS well with their surveying.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wellington Shire Council	10-05-2023	Email TO relevant person	TGS replied to WSC's email received earlier that day thanking them for their reply and time. TGS advised they have noted WSC's comments and offered to please get in contact if they have any queries.	N	N/A	* (see note above table)	Continuing consultation.
West Coast Council	16-02-2023	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
West Coast Council	16-02-2023	Email FROM relevant person	Automated email acknowledging TGS email and advising the email has been forwarded to the appropriate department for a response or action within 10 working days of receipt.	N	Continuing consultation	* (see note above table)	Continuing consultation
West Coast Council	24-04-2023	Email TO relevant person	TGS emailed WCC to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WCC to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
West Coast Council	24-04-2023	Email FROM relevant person	Automated email responding to email TGS sent earlier in the day acknowledging email and advising email will be forwarded to appropriate department who will formally acknowledge receipt of request within two working days.	N	Continuing consultation	* (see note above table)	Continuing consultation
West Coast Council	26-04-2023	Email FROM relevant person	WCC replied to TGS' email sent 24/04/2023 advising they have no concerns regarding the survey.	N	N/A - no concerns	N/A	Consultation closed
West Coast Council	28-04-2023	Email TO relevant person	TGS replied to WCC's email received 26/04/2023 thanking them for their reply and noting they have no concerns regarding their survey. TGS closed the email asking if WCC still wanting to be kept on TGS' consultation list to keep updated with survey progress or would they prefer to be removed. TGS added WCC can always contact them if they have a query or need further information.	N	N/A	N/A	Consultation closed
West Coast Council	28-04-2023	Email FROM relevant person	WCC replied to TGS' email sent earlier that day advising TGS can remove WCC from their consultation list. TGS replied thanking them for their prompt reply.	N	N/A	N/A	Consultation closed
West Tamar Council	16-02-2023	Email TO relevant person	TGS advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
West Tamar Council	16-02-2023	Email FROM relevant person	Automated email acknowledging email had been received and will be allocated to the appropriate team or officer.	N	Continuing consultation	* (see note above table)	Continuing consultation
West Tamar Council	27-04-2023	Email TO relevant person	TGS replied to WTC's email received 16/02/2023 querying TGS' email. TGS thanked WTC for their patience with their response and advised that recent changes in the survey planning show WTC is out of the survey scope. TGS closed the email by advising they would remove WTC from the consultation list.	N	N/A - out of survey or EMBA range.	N/A	Consultation closed
Western Abalone Divers Assn (Abalone Western Zone)	15-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Western Abalone Divers Assn (Abalone Western Zone)	24-04-2023	Email TO relevant person	TGS emailed WADA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WADA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Western Abalone Divers Assn (Abalone Western Zone)	19-05-2023	Email TO relevant person	TGS emailed relevant person advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 26/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Western Abalone Divers Assn (Abalone Western Zone)	25-05-2023	Email TO relevant person	TGS emailed an alternative contact at WADA advising they had been attempting to correspond with them about their proposed marine seismic survey within the Otway Basin to include them in their consultation program. TGS commented they had not received a response from them but advised its not too late and to provide any input back to TGS prior to 31/05/2023 so they can consider their information within the development of the environmental plan before submitting to NOPSEMA mid-June for their review. TGS closed the email by stating if they had any questions or would like more information to reply to the email.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	12-05-2022	Email TO relevant person	Advised of proposal to undertake the Otway Basin 3D Multi-client MSS. Attached Information Sheet provided information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures Requested any feedback be provided prior to 01/07/2022.	Y - Information Sheet - Map presenting survey relative to SA fisheries reporting blocks - Area Co-ordinates	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	31-05-2022	Email TO relevant person	TGS/Schlumberger invited WFSA to a call with other relevant fisheries stakeholders on June 2nd 2022 11:00am AEST. Three additional dates were given for alternative meeting days/times and the stakeholder was asked to indicated their availability during these times if they are unable to attend the June 2nd meeting. The times given were. •Wednesday 8th June – Between 11 am and 4 pm Victoria/Tasmania time (between 10:30 am and 3.30 pm SA time) •Thursday 9th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) •Friday 10th June – Between 11 am and 5 pm Victoria/Tasmania time (between 10:30 am and 4.30 pm SA time) TGS/Schlumberger noted that the 2D tie line extension area near King Island had been removed.	Y - Updated information sheet - Boundary coordinates	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	22-06-2022	Email TO relevant person	TGS/Schlumberger expressed a desire to engage with the stakeholder in a meeting to discuss any questions they may have regarding the potential for the project to interact with fisheries. TGS/Schlumberger asked if the stakeholder could provide some days/times they would be available for a meeting.	N	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	14-02-2023	Email TO relevant person	Reconnected to advise of changes to survey (area size and contact details) and provide updated Information Sheet. Requested any feedback be provided prior to 16/03/2023.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	15-02-2023	Email FROM relevant person	Automated reply advising TGS' emailed sent 14/02/2023 was undeliverable.	N	Continuing consultation	* (see note above table)	Continuing consultation

Relevant Person	Date of Correspondence	Type of Correspondence	Summary of Correspondence	Attachments	Assessment of Merit (Objection or Claim)	Reference to Location within the EP	Status of Consultation
Wildcatch Fisheries South Australia	24-04-2023	Email TO relevant person	TGS emailed WFSA to see if they had any queries about their proposed marine seismic survey within Otway Basin as TGS had not received any response to their previous email and information. TGS advised they want to make sure they have sent sufficient information to know if the survey impacts their functions, interests or activities and then TGS can discuss any queries or concerns they may have to ensure they are addressing them in their survey planning and environmental plan. TGS attached an updated information sheet and asked WFSA to reply and advise if they would like to discuss further or would like more information. Alternatively, they can let TGS know if the survey is not of interest or relevant to them and they will be removed from the consultation list.	Y - Updated information sheet	N/A	* (see note above table)	Continuing consultation.
Wildcatch Fisheries South Australia	25-04-2023	Email FROM relevant person	Automated reply advising TGS' emailed sent 24/04/2023 was undeliverable.	N	Continuing consultation	* (see note above table)	Continuing consultation
Wildcatch Fisheries South Australia	19-05-2023	Email TO relevant person	TGS emailed WFSAI seeking feedback on TGS' proposal to undertake a marine seismic survey within the Otway Basin. TGS attached an information sheet providing information on: · the location, schedule and description of activities to be undertaken; · types of vessels to be used and logistical arrangements, as known; · potential impacts and control measures. TGS also explained they would like to hear from WFSA to ensure they know about their functions, interests or activities that may be impacted by the survey and explained why they were contacted as a potential relevant person that may be impacted by an unplanned release of the vessels fuel from a collision. TGS asked WFSA to reply before 26/05/2023 and advise if they would like to discuss further or would like more information or alternatively if the survey is not of interest or not relevant and TGS will remove then from their consultation list.	Y - Information sheet	N/A	* (see note above table)	Continuing consultation.

APPENDIX L

PAM Specifications

PAM Specifications

Cetacean Detection Capability

The vocalisations made by the full range of marine mammal species can be detected by our PAM systems. Typical system configuration has the capability of detecting sounds within a frequency range of 200 Hz to 200 kHz. This frequency band covers most marine mammal vocalisations. The system sensitivity may be extended to 10 Hz to 200 kHz for surveys in which it is necessary to monitor for baleen whales that vocalise at very low frequencies. However, in some circumstances, vessel noise at low frequencies can mask marine mammal vocalisations and limit the performance of PAM. The frequency response of some hydrophone channels is set to counter this (e.g. lower frequency response of 2 kHz for channels designed to detect the majority of species vocalisations). Seiche can readily tailor the frequency sensitivity of the hardware to suit the project application and the range of marine mammal species likely to be encountered. Additionally, PAMGuard software can be configured to focus on the detection of the vocalisations of particular species of interest or concern.

PAMGuard Software

PAMGuard software is integrated into all our PAM systems. PAMGuard is industry-standard software for the acoustic detection, localization and classification of vocalizing marine mammals. It is a sophisticated and extendible software package that assists trained operators in robust decision-making during real-time mitigation operations. As an open source development, PAMGuard is publicly owned and freely available. PAMGuard development is led by a team of specialists at the University of St Andrews, U.K. This has to date been funded by industry via the IOGP Sound and Marine Life Joint Industry Program. Funding is now transitioning to a self-funding mechanism operated through voluntary user contributions.

Table 1. Hydrophone elements frequency range

Hydrophone Elements	
H1	10 Hz to 200 kHz (-3 dB points)
H2	10 Hz to 200 kHz (-3 dB points)
H3	2 Hz to 200 kHz (-3 dB points)
H4	2 Hz to 200 kHz (-3 dB points)

Table 2. Hydrophone sensitivity

Hydrophone sensitivity	
Broadband channel sensitivity	-166 dB re 1V/µPa (nominal)
Standard channel sensitivity	-157 dB re 1V/µPa (nominal)

APPENDIX M

Marine Mammal Control Measures

SUMMARY OF PROPOSED MARINE MAMMAL CONTROL MEASURES

Based on the distribution and likelihood of marine mammals in the Operational Area (**OA**) (as described in **Section 4.5.6** of the EP) and as per the definitions outlined in the EPBC Act Policy Statement 2.1:

- There is a high likelihood of encountering whales in the OA;
- The OA overlaps with the defined biologically important habitat (BIA) for blue whales (i.e. an annual high use foraging area and the flanking known foraging areas/likely foraging areas) and has been nominated as an extension of the existing BIA; and
- The OA overlaps biologically important habitat for southern right whales (i.e. known core range) and approaches the boundary of a biologically important aggregation area (which occurs 14 km inshore of the OA).

On this basis, the application of both standard management procedures and additional management procedures is necessary to ensure that potential impacts from the proposed Seismic Survey to marine mammals are managed to an acceptable level.

Modelling of underwater noise from the 3,480 in^3 acoustic source has been conducted (see **Section 7.2.1.2** of the EP), and while the modelled results indicate that the standard management procedures outlined in EPBC Act Policy Statement 2.1[1] will be sufficient to protect high-frequency odontocete whales, additional control measures are required to protect low-frequency baleen whales.

The control measures below are proposed to ensure full compliance with the EPBC Act Policy Statement 2.1 and the relevant Conservation Management Plans (blue whales, and southern right whales). Where species identification is uncertain, a precautionary approach will be adopted.

In accordance with the EPBC Act Policy Statement 2.1, no control measures are required for dolphins and the modelling results support this approach.

TERMINOLOGY

In accordance with the EPBC Act Policy Statement 2.1, the term 'whale' refers to baleen whales and other large, toothed whales such as, sperm whales, killer whales, false killer whales, pilot whales and beaked whales.

For clarity, all whale species other than blue whales/pygmy blue whales **(BW/PBW)** and southern right whales (**SRW**) are herein referred to as 'other whales', meaning:

- All baleen whales excepting BW/PBW and SRW; e.g. humpback, fin, sei, Bryde's, pygmy right, and minke whales; and
- All large, toothed whales; e.g. sperm whales, killer whales, false killer whales, pilot whales, pygmy sperm whale, dwarf sperm whale, and beaked whales; and
- Spectacled porpoise[2].

[1] Namely the 500 m shutdown zone, the 2 km low power zone and the 3+ km observation zone.
[2] Note that spectacled porpoises may occur in and around the OA, and model results indicate that (as a very high frequency cetacean) it should be afforded protection from acoustic injury associated with underwater noise (see **Section 7.2.2.2.7** of the EP).

The measures that are specific to 'other whales' have been developed on the basis that free-ranging pelagic animals are not expected to remain in the vicinity of the Seismic Vessel for extended periods and the movement of the Seismic Vessel means that any potential exposure will be transitory in nature.

MANAGEMENT PROCEDURES – ALL WHALES

Unless otherwise stated, the following management procedures (**MP**s) apply to the following species and will be implemented throughout the entire OA[3] for the duration of the survey:

1) 'other whales'; and
2) BW/PBW; and
3) SRW.

Where management procedures for all whales are superseded by species specific controls, this has been identified as a footnote. In these cases, the applicable BW/PBW or SRW management procedures are described in the subsequent sections of this appendix.

In addition, while standard management procedures outlined in the EPBC Act Policy Statement 2.1 will be adopted for the Seismic Survey, TGS has adapted some of these measures to provide increased protection to marine mammals. These are marked with an 'AC' superscript to denote an 'additional control'.

- MP 1: During daylight hours at least one marine fauna observer (**MFO**) will be on duty at all times from the Seismic Vessel and one MFO will be on duty at all times from the Attending Support Vessel[4] to undertake continuous visual observations for marine mammals[AC].
- MP 2: MFOs will implement a 5+ km Observation Zone[AC] from the acoustic source[5]. In practise this means that MFOs will be required to scan as far as possible towards the horizon given the prevailing sightings conditions. In those circumstances when monitoring of the Observation Zone is a pre-requisite to certain operations (see **AMP 1**), the minimum radius permissible will be 5 km. Note that the implementation of this Observation Zone does not prohibit Low Visibility or Night-time Operations (see **MP 9**) but whenever conditions allow, this zone will be monitored.
- MP 3: During daylight hours, Pre Start-up Visual Observations for the presence of whales within the 5+ km Observation Zone will be undertaken for at least 30 minutes before the commencement of the Soft Start Procedure.
- MP 4: If no whales have been sighted within the relevant Shut-down Zones, Soft Start Procedures will commence over a 30-minute period.
- MP 5: A 2 km Shut-down Zone[AC] for all whales will be implemented throughout the entire OA at all times[6]. On this basis a Low Power Zone is unnecessary.

[3] Including those BIAs and buffers that apply to BW/PBW and SRW.
[4] Where 'Attending Support Vessel' means the vessel that is accompanying the Seismic Vessel at close range at any one time. Noting that it could be the support, chase, or supply vessel; but at least one of these vessels is required to be in attendance at any one time.
[5] This distance has been selected on the basis that blue whale detection can be reasonably expected to 5 km over a range of sighting conditions.
[6] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.

- MP 6: A Start-up Delay will occur if a whale enters or is detected in any relevant Shut-down Zone during the soft start. Whale presence within the Shut-down Zone will trigger an immediate and complete shut-down. Soft Start Procedures may only resume after the whale has been observed to move outside the Shut-down Zone, or when 30 minutes have lapsed since the last whale sighting.
- MP 7: If a whale is detected within any nominated Observation Zone during the Seismic Survey, an additional MFO will be stationed on the bridge of the vessel from which the detection was made to assist with observations. The only permissible exception to this is when the off-duty MFO is on a meal or toilet break or is standing-down having reached maximum shift duration for that particular working day. In these instances a trained crew member will assist with marine mammal observations.
- MP 8: Stop Work Procedures will be implemented for the entire duration in which operations are underway as follows: the acoustic source will shut-down immediately whenever a whale is detected in, or about to enter, any relevant Shut-down Zone. Soft Start Procedures may only resume after the whale has been observed to move outside the Shut-down Zone, or when 30 minutes have lapsed since the last whale sighting.
- MP 9: Low Visibility[7] or Night-time[8] Operations may occur provided that there have not been three or more whale instigated shut-down situations during the preceding 24-hour period[9].
- MP 10: When species identification is uncertain, a precautionary approach will be taken, and the most conservative option in accordance with the additional management procedures for BW/PBW or SRWs will be followed until identification is otherwise confirmed.

The Extended Precaution Zones for 'other whales' are depicted in **Figure 1**.

ADAPTIVE MANAGEMENT PROCEDURES – OTHER WHALES

Unless otherwise stated, the following adaptive management procedures (**ADMP**s) will be followed throughout the entire OA[10] for the duration of the survey, noting that the maximum onset distance predicted by underwater acoustic modelling for behavioural effects was c. 12 km for all species.

- ADMP 1: If three or more 'other whale' instigated shut-downs occur within a 24-hour period, the Seismic Vessel will relocate at least 12 km in the direction away from the sightings before commencing Pre Start-up Visual Observations and Soft Start Procedures[11].
- ADMP 2: If an 'other whale' mother and calf pair is observed within 12 km[12] of the active acoustic source during the Seismic Survey, the acoustic source will be immediately shut down and the Seismic Vessel will relocate to another area at least 12 km away from the last recorded position of the mother/calf pair before commencing Pre Start-up Visual Observations and Soft Start Procedures[13].

[7] When observations cannot extend to 5 km from the acoustic source, e.g. during fog or periods of high winds.
[8] The hours between sunset and sunrise at any given location.
[9] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.
[10] Including those BIAs and buffers that apply to BW/PBW and southern right whales.
[11] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.
[12] Note that the intention here is not to provide full MFO coverage of this zone, but to opportunistically respond to any mother/calf sightings that are detected within a 12 km radius. If the sighting occurs outside 12 km (i.e., during aerial surveys or support vessels en-route to resupply) no action will be required.
[13] This measure is superseded by Additional Management Procedures applicable to BW/PBW and SRW.

ADDITIONAL MANAGEMENT PROCEDURES – GENERAL

The following additional management procedures (**AMP**s) apply to all operations:

- AMP 1: Soft start procedures throughout the OA can only proceed under the following circumstances:
    a. If no acquisition has occurred in the preceding 24 hours, soft starts may only commence in daylight hours and when conditions allow visual inspection of the 5+ km Observation Zone[AC];
    b. If acquisition has occurred within the preceding 24 hours and no whale initiated shut downs have been made during this period, then soft starts may commence at night or during periods of low visibility providing they occur outside of the BW BIAs/buffer and the SRW Ag BIA/buffer.
- AMP 2: 2D tie line acquisition inside any BIA/buffer will only be permitted to occur in daylight hours, and two MFOs must be on duty on the Seismic Vessel and two MFOs must be on-duty on the Attending Support Vessel. 2D tie line acquisition inside any BIA/buffer can occur at any time providing the following criteria are met:
    a. An aerial survey has been conducted within 4 days of such operations commencing and no baleen whales have been detected. This aerial survey must focus on the area of planned acquisition that overlaps the BIA/buffer and must extend to at least 42 km on either side of the planned 2D sail line;
    b. 2D tie line acquisition inside any BIA/buffer must not occur for more than 12 hours total within any 24 hour period;
    c. The Extended Observation Zone as described in BMP 4 is implemented; and
    d. The acoustic source must not be active for more than a combined total of 20 hours (maximum) in the BIAs/buffers.
- AMP 3: Marine mammal observations made during the Seismic Survey will be undertaken by dedicated, trained and experienced MFOs. All MFOs must have proven 'at sea' experience in whale identification and behaviour, and distance estimation, and must be confident in the identification of those species that the EP predicts will be present in the OA. All MFOs will hold a JNCC Marine Mammal Observation certification (or equivalent). In addition, the lead MFO on the Seismic Vessel must have logged a minimum of 20 weeks' relevant sea-time engaged in marine seismic survey operations in Australian waters as an MFO.
- AMP 4: A minimum of two MFOs will be onboard the Seismic Vessel for the duration of the Seismic Survey and two additional MFOs will be stationed on the Attending Support Vessel.
- AMP 5: A passive acoustic monitoring (**PAM**) system will run 24 hours per day on the Seismic Vessel during the Seismic Survey, with dedicated, trained and experienced PAM Operators conducting acoustic monitoring for the presence of cetaceans[14] while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedure.
- AMP 6: At least two dedicated, trained and experienced PAM Operators will be on the Seismic Vessel for the duration of the survey, with at least one PAM Operator maintaining 'acoustic watch' at all times while the acoustic source is active and during the 30 minutes before the commencement of any Soft Start Procedure.

[14] PAM is not considered to be a particularly reliable method for detecting low-frequency cetaceans. On this basis, management measures for baleen whales have been developed to remove the reliance on PAM while still maintaining a high level of protection.

- AMP 7: The lead PAM Operator must have logged a minimum of 20 weeks' relevant sea-time engaged in seismic survey operations in Australian waters as a PAM Operator. All PAM Operators will need to be able to demonstrate competency in the acoustic identification of the species that are likely to be present during the Seismic Survey, and in interpreting acoustic software and estimating distance to any detected whale calls.
- AMP 8: A full replacement PAM system will be kept onboard the Seismic Vessel and will be used as a back-up if the PAM system malfunctions and is unable to be repaired.
- AMP 9: In the event that the PAM system malfunctions or becomes damaged, seismic operations may continue for 20 minutes without PAM while the PAM Operator diagnoses the issue. If it is found that the PAM system needs to be repaired or replaced, seismic operations may continue for an additional two hours without operational PAM as long as: a) it is daylight hours and the sea state is less than or equal to Beaufort 4, b) no whales were detected solely by PAM in the relevant mitigation zones in the previous two hours; c) two MFOs maintain watch at all times during seismic operations when PAM is not operational, d) seismic operations with an active source, but without an active PAM system, do not exceed a cumulative total of four hours in any 24-hour period.
- AMP 10: The PAM system will be programmed to receive/recognise vocalisations of whales within the frequencies 10 Hz to 200 Hz. The frequency range will theoretically be tuned to detect both low frequency vocalisations of baleen whales and the high frequency echolocations of sperm whales.
- AMP 11: PAMGuard software will be incorporated into the PAM system to assist with locating and classifying the vocalisations of marine mammals, and the PAM Operators will be suitably trained in using the PAMGuard software.

ADDITIONAL AND ADAPTIVE MANAGEMENT PROCEDURES – BLUE WHALES/PYGMY BLUE WHALES

Animat modelling has been used to inform the development of the following control measures for blue whales. As the two subspecies of blue whales are difficult to distinguish at sea, these controls will be applied to both subspecies (denoted as **BW/PBW**). This modelling predicts the maximum onset distances for 24 hour cumulative PTS and TTS as 130 m and 32 km respectively. Cumulative TTS effects from acquisition on the continental slope are however only expected to occur to 15.4 km inshore of the active acoustic source on account of reduced sound propagation in the upslope direction. Therefore, acquisition within c. 16 km of the pygmy blue whale foraging BIAs or within the BIAs themselves has the potential to result in injury or displacement of a BW/PBW from a foraging area[15].

The maximum predicted onset distance for behavioural effects for BW/PBW is 7 km. This distance underpins the Shut-down Zone for BW/PBW. In addition, the 32 km maximum predicted onset distance for TTS has also been utilised in defining several control measures for BW/PBW.

It is noteworthy that the modelling undertaken was conservative, where 1) the worst-case scenarios for noise propagation were modelled to produce maximum estimates of onset distances for TTS and PTS, and 2) the modelled source locations and seasons were those expected to exhibit noise propagation over the greatest distances.

[15] Defined in the 'Guidance on key terms within the Blue Whale Conservation Management Plan' (published by DAWE in September 2021) as a designated foraging BIA.

The c. 16 km onset distance for cumulative TTS in the onshore direction has been used to define a buffer zone around the blue whale foraging BIAs (referred to as **BW BIAs** herein). No acquisition will occur within the BW BIAs or the 16 km buffer during the 'peak feeding season' from January to June (inclusive) based on the expected consistent and widespread presence of whales in the foraging areas during these months (Gill *et al*., 2011; 2015; McCauley *et al*., 2018). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2**) and will only take approximately 12 hours to acquire.

This spatio-temporal measure has been designed to eliminate any physical or behavioural effects on foraging BW/PBW in the designated BW BIAs during the foraging season; hence, to comply with the requirement of the Blue Whale Conservation Management Plan that blue whales can continue to use biologically important areas without injury and no blue whale will be displaced from a foraging area. On this basis, the protection afforded to BW/PBW in the BW BIAs is very strong during the peak months of foraging area use.

Operations inside the BW BIAs and the 16 km buffer (referred collectively as **BW BIAs/buffer** herein) will be permitted outside these months including during the 'foraging shoulder season' months of September to December and July when whales may be present, but densities are expected to be substantially lower and presence is less consistent. All operations inside the BW BIAs/buffer during the foraging shoulder season will be subject to the use of aerial surveys to assist with BW/PBW detection.

Throughout the survey an Extended Observation Zone (as described in **BMP 4** below) will be implemented and will serve the dual purpose of detecting BW/PBWs at extended distances in order to implement the 7 km Extended Shut-down Zone and to assist with survey planning in order to facilitate operational avoidance of areas where BW/PBWs are present. Several adaptive management measures are also proposed.

In light of the conservative approach taken by the modelling, the proposed controls (as summarised above and detailed below) demonstrate consistency with the objective of the Blue Whale Conservation Management Plan (that "*anthropogenic threats are demonstrably minimised*") and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered). On this basis, acoustic injury to BW/PBW can be managed to an acceptable level throughout the OA; hence, anthropogenic threats (as they relate to physiological impacts from underwater noise) are avoided through robust and adaptive management measures.

The following additional and adaptive management procedures for BW/PBW (denoted with **BMP**) will be implemented during the Seismic Survey:

- <u>BMP 1:</u> A 16 km buffer will be established around all BW BIAs where they overlap or approach the OA.
- <u>BMP 2:</u> The Seismic Vessel will not activate the acoustic source(s) within any BW BIAs/buffer from January to June (inclusive) which represents the peak foraging season during which BW/PBW are expected to consistently be present at foraging areas in and around the OA at elevated densities. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2**.
- <u>BMP 3:</u> A 7 km Extended Shut-down Zone will be implemented for BW/PBW throughout the OA (including the BW BIAs/buffer). On this basis a Low Power Zone is deemed unnecessary.

- BMP 4: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for BW/PBWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5-7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5-7 km ahead of the seismic vessel to assist with BW/PBW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met:
    a. The MFO onboard the EOZ Support Vessel continues observations for BW/PBWs;
    b. There have been no BW/PBW instigated shut downs in the preceding 6 hours; and
    c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel.
- BMP 5: Low Visibility or Night-time Operations may occur provided that no BW/PBW shut downs have been instigated during the preceding 24 hours within 32 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).
- BMP 6: During the 'foraging shoulder season' months of September to December and July the seismic vessel is permitted to operate in the BW BIAs/buffer in accordance with the following protocols:
    a. All reasonable efforts[16] will be made to ensure that aerial surveys will be conducted to assist with the detection of BW/PBW in the BW BIAs/buffer during the 'foraging shoulder season'. Within the seven days prior to commencement of any acquisition in the BW BIAs/buffer aerial surveys will be flown, if possible, to identify any BW/PBWs that may be present. Any such detections will result in acquisition within the BW BIAs/buffers being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of BW/PBWs in the BW BIAs/buffer by relocating to parts of the BW BIAs/buffer where potential impacts on BW/PBWs are less likely.
    b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.
    c. Aerial survey efforts will concentrate on the area of the BW BIAs/buffer nearest to the proposed start up location and/or those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Throughout the period in which acquisition is underway, aerial surveys will be flown periodically as weather permits to support the detection of BW/PBW and to redirect seismic survey efforts in order to avoid BW/PBW that are present.

[16] Noting that in some circumstances aerial surveys may not be possible due to weather or aircraft availability constraints.

d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of BW/PBW from the air.

e. Start-up (via soft start) can only commence in the BW BIAs/buffer during the 'foraging shoulder season' if the following criteria are met:

   i. A minimum of two hours of daylight remain before nightfall;

   ii. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone;

   iii. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no BW/PBW have been sighted; and

   iv. The start-up location does not occur within 32 km of an area where a BW/PBW detection has been made in the last four days.

- BMP 7: If a BW/PBW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut down and the seismic vessel will relocate to another area at least 32 km away from the last PBW sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible[17], then acquisition will cease and will not recommence until 24 hours have elapsed and no BW/PBW has been detected in the 7 km Extended Shut-down Zone.
- BMP 8: A Start-up Delay will occur if a BW/PBW enters or is detected in the 7 km Extended Shut-down Zone during the soft start, and soft start procedures may only resume once the BW/PBW is observed to move outside this Shut-down Zone or when 30 minutes have lapsed since the last BW/PBW sighting.
- BMP 9: If higher than anticipated numbers of BW/PBW are observed (three or more BW/PBW instigated shut downs are made during the preceding 48 hour period[18]) at any time or location during the survey, the following adaptive management controls will apply:

   a. Acquisition in the BW BIAs/buffer must cease;

   b. Low Visibility or Night-time Operations must cease; and

   c. Normal operations may only resume after 24 hours of no BW/PBW instigated shut downs.

The Precaution Zones for BW/PBW are depicted in **Figure 2**.

[17] For instance, towards the end of the survey when few survey lines remain to be acquired.
[18] Note that any unidentified whale/s will contribute to this count.

ADDITIONAL AND ADAPTIVE MANAGEMENT PROCEDURES – SOUTHERN RIGHT WHALES

Animat modelling has been used to inform the development of the following control measures for SRW. This modelling predicts the maximum onset distances for 24 hour cumulative PTS and TTS as 40 m and 11 km respectively. Based on these results, TTS effects are not predicted to extend from the OA into the Aggregation BIA (which occurs 14 km north of the OA) or any of the connecting habitat, migration and resting on migration BIAs that occur further afield in coastal waters. The predicted onset distance for behavioural effects for SRWs were assessed separately for 'mother/calf pairs' and 'other individuals' as 31.5 km and 6.1 km respectively. In keeping with the Shut-down Zone with BW/PBW, 7 km has been selected as the Shut-down Zone for SRW, to conservatively address the maximum predicted onset distance of 6.1 km for behavioural effects on individual (i.e., unaccompanied) SRWs. In addition to the Animat modelling and using a very conservative interpretation of the maximum-over-depth acoustic modelling results, behavioural effects to mother/calf pairs may indeed occur up to 42 km inshore of acquisition when it occurs closest to the Aggregation BIA.

The operative SRW Conservation Management Plan (CoA, 2012) states that "Noise interference is of particular concern within or close to southern right whale aggregation areas where young calves are present and whales are resident for long periods of time"; hence the measures described below are targeted to address these specific noise impacts. While there is another designated 'known core range' BIA in the area, the OA only marginally overlaps with this and the expectation is that animals traverse this area on their way to and from the more coastal aggregation areas and connecting habitat. Strong adaptive management measures have been developed to address potential noise effects in the wider area.

The 42 km onset distance for behavioural impacts to mother-calf pairs has been used to define a buffer zone around the SRW Aggregation BIA (referred to as the **SRW Ag BIA** herein). No acquisition will occur within the SRW Ag BIA or the 42 km buffer during the core aggregation months of May to September (SWIFFT 2023). The only exception allowed is the acquisition of the 2D tie line which will be subject to additional operational restrictions (see **AMP 2**) and will only take approximately 12 hours to acquire.

This spatio-temporal measure has been designed to eliminate any physiological or behavioural effects on SRWs in the SRW Ag BIA during the months over which SRWs are expected to be present. On this basis, compliance with Interim Recovery Objective 5 of the operative Southern Right Whale Conservation Management Plan that anthropogenic threats are demonstrably minimised, is achieved. This control also aligns with the recommendation in Policy 2.1 that seismic surveys should be undertaken outside of biologically important areas at biologically important times.

While the Draft National Recovery Plan for the Southern Right Whale (CoA, 2022) is not yet operative, once finalised it will supersede the operative plan. The conservation actions included in the draft plan that are of relevance to seismic survey noise are listed in **Table 1** along with how they are addressed by the proposed controls. TGS is aware that the designated BIAs are also being reviewed as part of the process underpinning the review of the recovery plan. There is a strong possibility that the BIA boundaries for SRWs will change prior to the commencement of the proposed survey. TGS can confirm that the 42 km buffer as described above will be applied to the updated aggregation/reproductive BIA should it be published before the survey commences.

Table 1 Assessment of proposed controls against the draft conservation actions outlined in the Draft National Recovery Plan for Southern Right Whales (CoA, 2022)

Draft Actions of Relevance to Anthropogenic Underwater Noise (Action Area A5)	How Addressed by the Proposed Controls
Improve baseline understanding of SRW acoustic communication to better assess potential impacts from anthropogenic underwater noise	The EP relies on the best available data as included in the Animat modelling undertaken by JASCO regarding SRW behaviour and acoustic communication.
Actions within and adjacent to SRW BIAs and 'Habitat Critical to Survival' should demonstrate that it does not prevent any SRW from utilising the area or cause injury (TTS and PTS) and/or disturbance.	The proposed 7 km Shut-down Zone prevents all PTS and single pulse TTS. Noting that cumulative TTS is predicted only if a SRW remained within 11 km of the active source for 24 hours. However, the vessel movement (average 8 km/hr) means that in practice TTS is unlikely as the vessel would be well beyond the TTS onset distances within 2 hours (i.e. much shorter than the 24 hrs of exposure needed to induce TTS). The 7 km Shut-down Zone protects all unaccompanied SRWs against behavioural effects (which are predicted to only occur to 6.1 km) and the 42 km buffer around the SRW Ag BIA protect mother calf pairs from behavioural disturbance. In addition, if a mother calf pair is detected outside the SRW Ag BIA/buffer (which could occur as they move south at the end of the breeding season), a shutdown will be triggered at any distance to prevent disturbance. In addition, no acquisition will occur within the SRW Ag BIA or the 42 km buffer during the core aggregation months of May to September.
Ensure environmental assessments associated with underwater noise generating activities include consideration of national policy (e.g., EPBC Act Policy Statement 2.1) and guidelines related to managing anthropogenic underwater noise and implement appropriate mitigation measures to reduce risks to SRWs to the lowest possible level	The EP contains a comprehensive assessment of the potential effects of underwater noise on SRWs. The survey adopts the EPBC Act Policy Statement 2.1 and oftentimes exceeds the requirements of this policy statement to ensure that the risks to SRWs are reduced to the lowest possible level.
Quantify risks of anthropogenic underwater noise to SRWs, including behavioural disturbance, changes to vocalisations, and physiological effects to whales	The EP contains a comprehensive assessment of the potential effects of underwater noise on SRWs, and Animat modelling has been conducted to specifically quantify the risks of underwater noise.
Prioritise government/industry funding opportunities to support research to identify short and long-term responses of SRWs to underwater noise	TGS is in dialogue with Blue Whale Study regarding the implementation of aerial surveys during the proposed seismic survey.
Improve understanding and characterisation of marine soundscapes, including the application of new technologies for data processing, within Southern Right Whale BIAs to facilitate quantification of anthropogenic noise in the marine soundscape	Animat modelling has been conducted to specifically quantify the risks of underwater noise. In particular two scenarios were modelled, one of which was specifically tailored to assess the effects of underwater noise in the SRW Ag BIA. The model was run for both mother/calf pairs and all other cohorts of unaccompanied SRWs.

The modelling took a conservative approach, whereby 1) the worst-case scenarios for noise propagation were modelled to produce maximum estimates of onset distances for TTS, PTS and behavioural effects, and 2) the modelled source locations and inputs were those expected to exhibit noise propagation over the greatest distances.

Operations inside the SRW Ag BIA and the 42 km buffer (referred collectively as **SRW Ag BIA/buffer** herein) will be permitted outside these months including during the aggregation shoulder months of April and October. All operations inside the SRW Ag BIA/buffer during the shoulder months will be subject to the use of aerial surveys to assist with SRW detection.

Throughout the survey an Extended Observation Zone (as described in **SRMP 4** below) will be implemented and will serve the dual purpose of detecting SRWs at extended distances in order to implement the 7 km Extended Shut-down Zone and to assist with survey planning in order to facilitate operational avoidance of areas where SRWs are present. Several adaptive management measures are also proposed.

In light of the conservative approach taken by the modelling, the proposed controls (as summarised above and detailed below) demonstrate consistency with the objective of the SRW Conservation Management Plan (that anthropogenic threats are demonstrably minimised) and the purpose of the Australian Whale Sanctuary (that cetaceans are not killed, injured, or interfered).

The adoption of the controls summarised above and detailed in the specific control measures below ensures that the protection afforded to SRWs, both inside the SRW Ag BIA and outside, is very strong and that the risks to SRWs are reduced to the lowest possible level.

The following additional and adaptive management procedures for SRW (denoted with **SRMP**) will be implemented during the Seismic Survey:

- SRMP 1: A 42 km buffer will be established around the SRW Ag BIA where it approaches the OA.
- SRMP 2: The Seismic Vessel will not activate the acoustic source(s) within the SRW Ag BIA/buffer from May to September (inclusive) which represents the core aggregation months during which SRWs are expected to be present here. The only exception allowed relates to the acquisition of the 2D tie line in accordance with the criteria outlined in **AMP 2**.
- SRMP 3: A 7 km Extended Shut-down Zone will be implemented for SRWs throughout the OA (including the SRW Ag BIA/buffer). On this basis a Low Power Zone is deemed unnecessary.
- SRMP 4: An 'Extended Observation Zone' will be adopted such that vessel based MFOs observe for SRWs as far as practicable, and to a minimum of 7 km during daylight hours. During periods when visibility is < 7 km, the Extended Observation Zone will be monitored by the combined efforts of the MFOs on both the Seismic Vessel and at least one Support Vessel travelling approximately 5-7 km ahead of the Seismic Vessel. This Support Vessel will focus monitoring efforts on the 90° quadrant that lies directly ahead of the Seismic Vessel, and in reference to these specific duties, is herein referred to as the EOZ Support Vessel. When visibility is > 7 km, this Extended Observation Zone may be monitored solely by MFOs on the seismic vessel. At these times the EOZ Support Vessel will be available to assist with vessel operations and port calls; however, whenever possible the intention is that the EOZ Support Vessel shall maintain its position 5-7 km ahead of the seismic vessel to assist with SRW detections. The only permissible exceptions to the specified EOZ Support Vessel duties will be issues of safety that require relocation of the EOZ Support Vessel or in the event of incidents involving significant risk to in-sea equipment when the EOZ Support Vessel will be permitted to temporarily assist providing the following criteria are met:

    a. The MFO onboard the EOZ Support Vessel continues observations for SRWs;

b. There have been no SRW instigated shut downs in the preceding 6 hours; and

c. No more than 4 hours elapse before the EOZ Support Vessel resumes its position ahead of the Seismic Vessel.

- SRMP 5: Low Visibility or Night-time Operations may occur provided that no SRW shut downs have been instigated during the preceding 24 hours within 42 km of the planned acquisition (i.e. the survey lines that will occur during the hours of darkness or the period of low visibility).
- SRMP 6: During April and October (shoulder aggregation months) the Seismic Vessel is permitted to operate in the SRW Ag BIA/buffer in accordance with the following protocols:

a. All reasonable efforts will be made to ensure aerial surveys will be conducted to assist with the detection of SRWs in the SRW Ag BIA/buffer during April and October. Within the seven days prior to commencement of any acquisition in the SRW Ag BIA/buffer, aerial surveys will be flown, if possible, to identify any SRW that may be present. Any such detections will result in acquisition within the SRW Ag BIA/buffer being redirected away from areas in which such detections have been made. The intent of this control is to allow TGS to respond adaptively to detections of SRWs in the SRW Ag BIA/buffer by relocating to parts of the OA where potential impacts on SRWs are less likely.

b. If the requirement for aerial surveys as outlined in (a) above cannot be achieved, no low visibility or night time operations may occur inside the BW BIAs/buffer until such time as the aerial survey requirement is met.

c. Aerial survey efforts will concentrate on the area of the SRW Ag BIA/buffer nearest to those waters that will be subject to acquisition in the first 24 hours of planned seismic operations. Aerial surveys should also monitor any nearby waters of the known core range BIA that acquisition will soon occur in. Throughout the period in which acquisition in the SRW Ag BIA/buffer is underway, aerial surveys will be flown periodically as weather permits to support the detection of SRWs and to redirect seismic survey efforts in order to avoid areas where SRWs are present.

d. Aerial surveys must be undertaken by two experienced observers from a suitable aircraft. At least one of these observers must demonstrate previous experience in the detection and identification of SRW from the air.

e. Start-up (via soft start) can only commence in the SRW Ag BIA/buffer during April and October if the following criteria are met:

i. A minimum of two hours of daylight remain before nightfall;

ii. Good sightings conditions prevail that allow visual observations of the Extended Observation Zone;

iii. A Support Vessel is available to undertake the requisite marine mammal monitoring;

iv. MFOs on board the Seismic Vessel and the EOZ Support Vessel have completed at least 30 minutes of pre-start observation procedures and confirmed no SRWs have been sighted; and

v. The start-up location does not occur within 42 km of an area where a SRW detection has been made in the last four days.

- SRMP 7: If a SRW is detected in the 7 km Extended Shut-down Zone during the survey the acoustic source will be immediately shut down and the seismic vessel will relocate to another area at least 11 km away from the last SRW (unaccompanied) sighting before commencing Pre Start-up Visual Observations and Soft Start Procedures. Note that this distance increases if a calf is present in accordance with **SRMP 10**. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.

- SRMP 8: A Start-up Delay will occur if a SRW enters or is detected in the 7 km Extended Shut-down Zone during soft start, and soft start procedures may only resume once the SRW is observed to move outside this Shut-down Zone or 30 minutes have lapsed since the last SRW sighting.

- SRMP 9: If higher than anticipated numbers of SRW are observed (three or more SRW instigated shut downs are made during the preceding 48 hour period[19]) at any time or location during the survey, the following adaptive management controls will apply:

    a. Acquisition in the SRW Ag BIA/buffer must cease

    b. Low Visibility or Night-time Operations must cease;

    c. The acoustic source will be shut down and the Seismic Vessel will relocate to another area at least 42 km away from the last SRW sighting, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone; and

    d. Normal operations may only resume after 24 hours of no SRW instigated shut downs.

- SRMP 10: If a SRW mother and calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Seismic Survey, the acoustic source will be immediately shut down and the Seismic Vessel will relocate to another area at least 42 km away, and outside of the SRW Ag BIA/buffer, before commencing Pre Start-up Visual Observations and Soft Start Procedures. If relocation of the seismic vessel is not possible, then acquisition will cease and will not recommence until 24 hours have elapsed and no SRW has been detected in the 7 km Extended Shut-down Zone.

The Precaution Zones for SRW are depicted in **Figures 3**.

[19] Note that any unidentified whale/s will contribute to this count.

Figure 1 Extended Precaution Zones: Other Whales

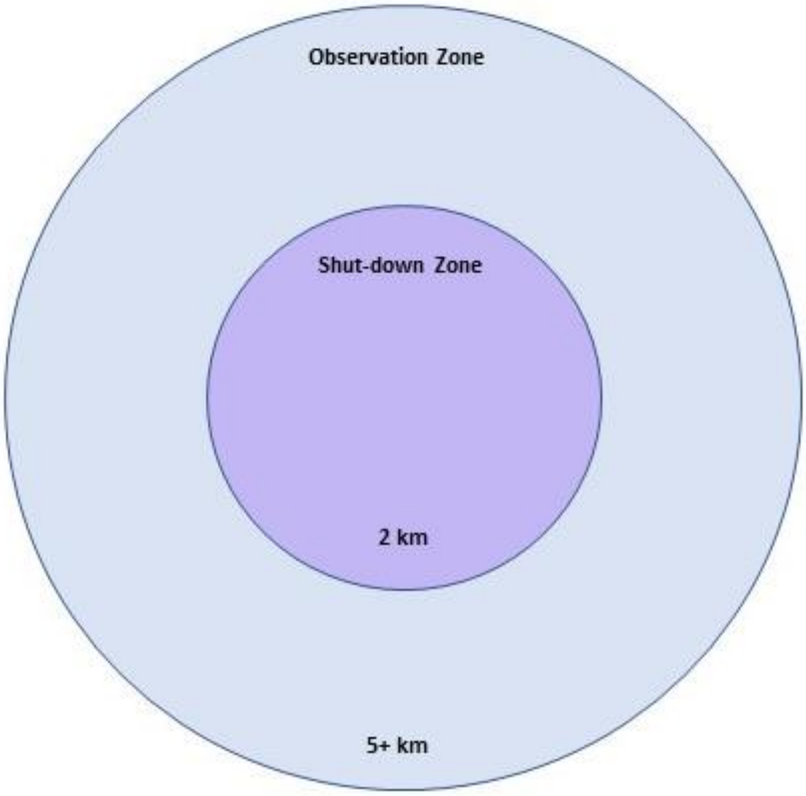


Figure 2 Extended Precaution Zones: Blue Whales/Pygmy Blue Whales

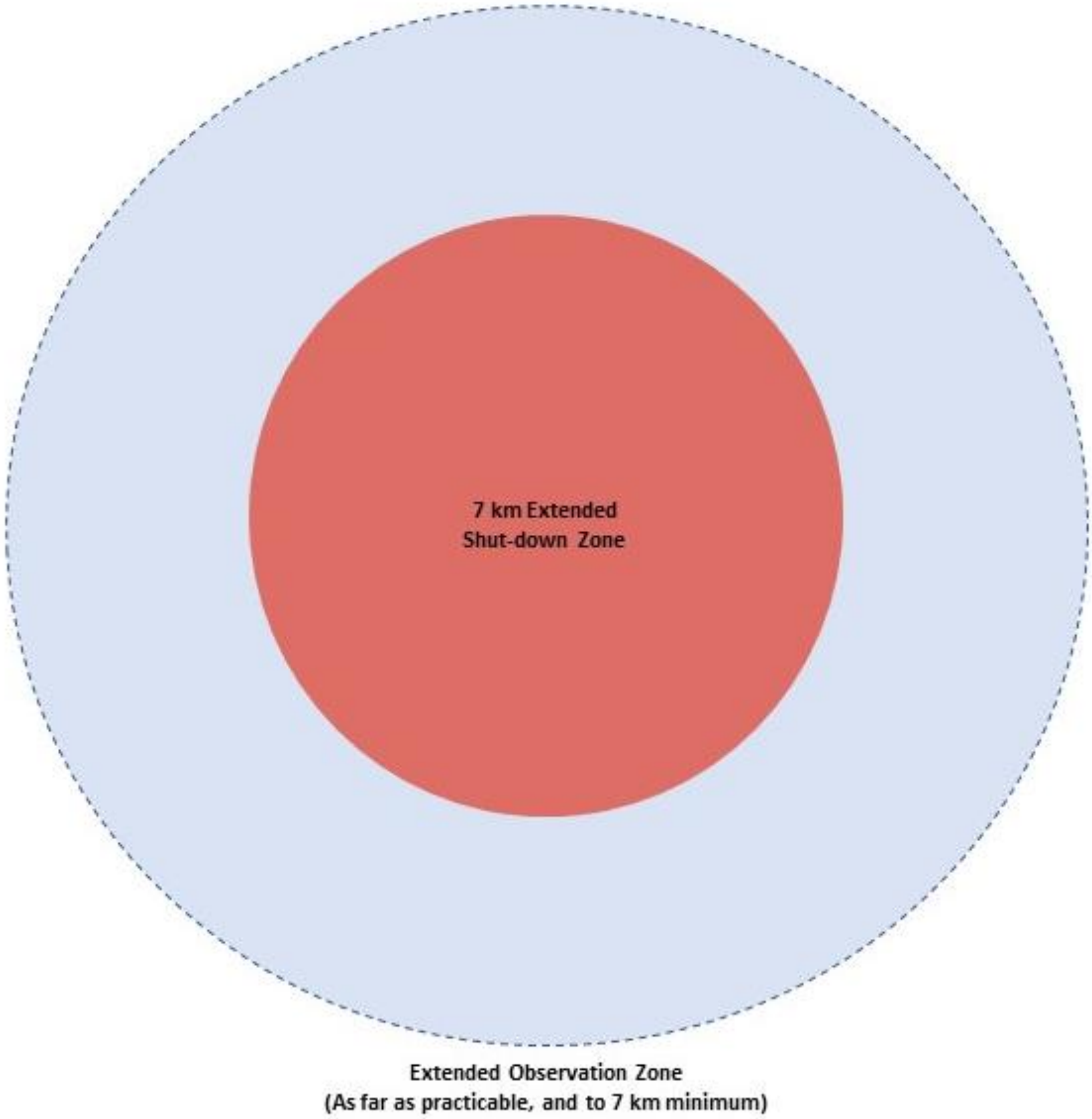
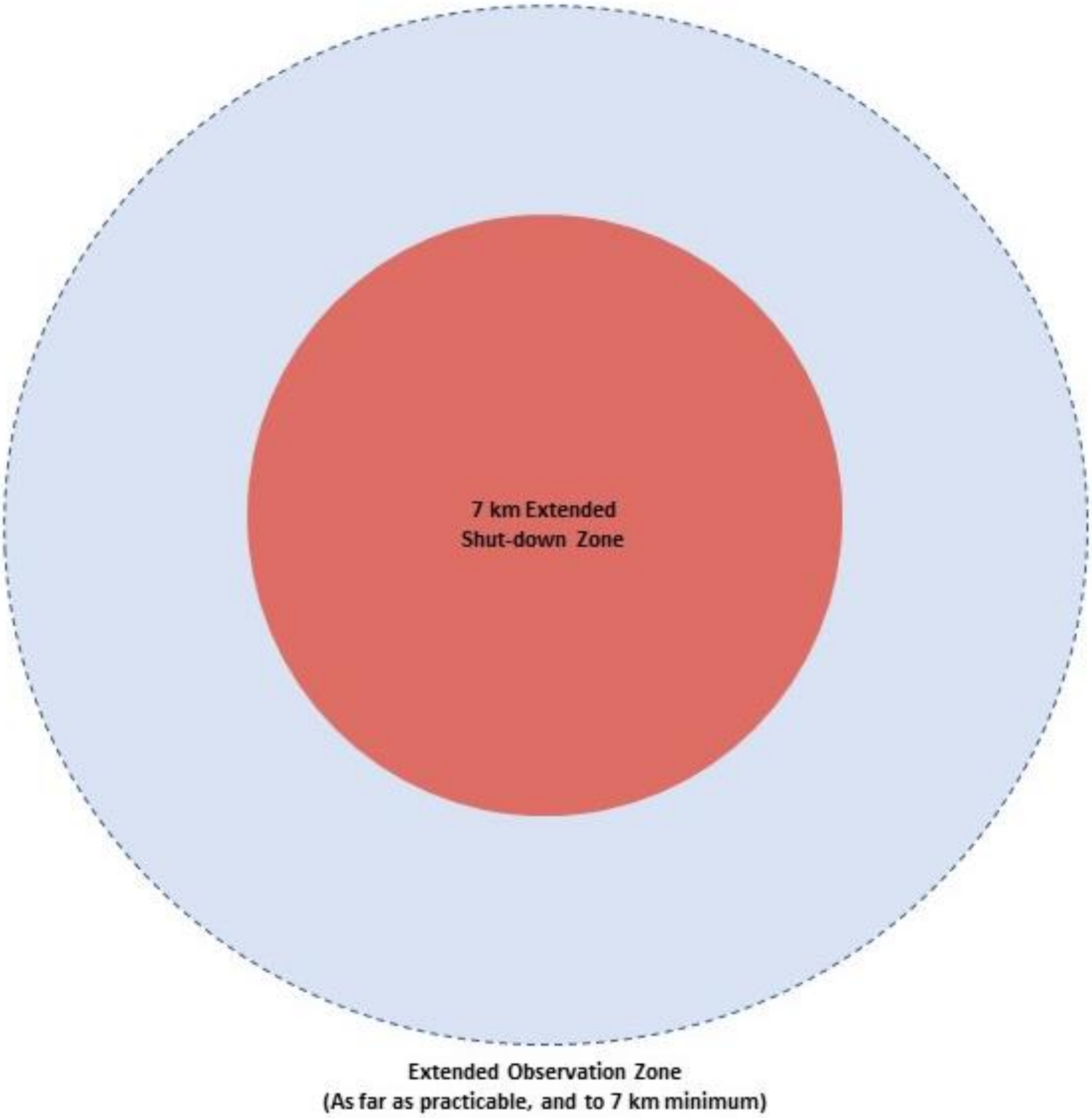


Figure 3 Extended Precaution Zones: Southern Right Whales



MOTHER/CALF PAIR SIGHTINGS:

If a mother/calf pair is observed from the Seismic Vessel or the Attending Support Vessel at any distance during the Seismic Survey, the acoustic source will be immediately shut down.

APPENDIX N

Commercial Fisheries Compensation Protocol

Sensitive information – content removed.

APPENDIX O

Oil Spill Management Plan

OTWAY BASIN 3D MULTI-CLIENT MARINE SEISMIC SURVEY

Operational Scientific Monitoring Plan

Prepared for:

TGS
Level 9, 220 St George's Terrace
Perth, WA 6000

SLR Ref: 640.30610.00000-R01
Version No: -v1.0
June 2023

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 11, 176 Wellington Parade
East Melbourne VIC 3002 Australia
T: +61 3 9249 9400
E: melbourne@slrconsulting.com   www.slrconsulting.com

BASIS OF REPORT

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.30610.00000-R01-v1.0	29 June 2023	SLR Consulting		

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

CONTENTS

1 Introduction

1.1 Purpose

The Operational and Scientific Monitoring Plan (**OSMP**) is an operational document and provides further detail on how the OSMP will be implemented in the event of a Level 2 spill. Specifically, this OSMP Logistics and Monitoring Plan demonstrates how the Type I Operational and Type II Scientific monitoring tasks assigned to the approved Service Provider would be implemented on behalf of TGS in the event that monitoring is initiated.

Section 10.10 of the EP Implementation Strategy contains an Oil Pollution Emergency Plan (**OPEP**) which introduces the framework of the OSMP. The OSMP framework broadly outlines the details of Type I Operational Monitoring and Type II Scientific Monitoring studies which would be undertaken in the event of a Level 2 hydrocarbon spill. These plans are an integrated package of environmental management documents designed to manage environmental issues and protect the environment during the Otway Basin 3D MC MSS.

This OSMP document provides further detail on how the OSMP will be implemented in the event of a Level 2 spill. Specifically, this OSMP Logistics and Monitoring Plan demonstrates how the Type I Operational and Type II Scientific monitoring tasks assigned to SLR would be implemented on behalf of TGS in the event that monitoring is initiated.

This OSMP has been developed in accordance with the requirements of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (**OPGGS Act**) and associated the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (**OPGGS(E)R**). It has also been prepared with reference to the following documents published by the National Offshore Petroleum Safety and Environmental Management Authority (**NOPSEMA**):

- GN1488 Oil Pollution Risk Management guidance note (Rev 2, Feb 2018); and
- N-04700-IP1349 Operational and scientific monitoring programs information paper (Mar 2016).

1.2 Scope

Any spill resulting in a release of hydrocarbons into the marine environment is an oil pollution incident for the purposes of this OSMP.

This document has been prepared to cover Otway Basin 3D MC MSS activities within the operational area (**OA**), located within the South-East Marine Region in Commonwealth waters, offshore from south-eastern Australia. The acquisition area comprises approximately 45,000 square kilometres (km^2) and is surrounded by a larger OA covering 55,000 km^2. The OA is located approximately 31 km from the mainland at the closest point (**Figure 1**).

Other key coastal locations of relevance to the OA include:

- Portland, VIC: 45 km north of the OA;
- Warrnambool, VIC: 61 km north-northeast of the OA;
- Arthur River, TAS: 85 km east of the OA;
- King Island, TAS: 39 km east of the OA; and
- Port MacDonnell, SA: 39 km north of the OA.

Potential spills scenarios considered in the development of this OPEP are:

- Level 1: Spill of hydrocarbons (lubrication oil or hydraulic fluid);
- Level 1: Spill during vessel refuelling resulting in release of up to 10 m^3 of Marine Diesel Oil (MDO); and
- Level 2: Release of marine diesel to the environment following a vessel collision and resulting in rupture of one or more fuel storage tanks. Based on the maximum volume of the proposed survey vessel(s), the maximum credible release volume would be 1066 m^3 over a period of six hours.

The document provides guidance for response personnel for the initial hours following a hydrocarbon release. Upon notification the CA Incident Management Team (**IMT**) will have taken over responsibility for the response and will develop their own incident action plan (**IAP**). The IAP will form the basis of transitioning to an ongoing response following the first strike response period.

OSMP implementation will continue beyond the initial response by the vessel and will remain the responsibility of TGS.

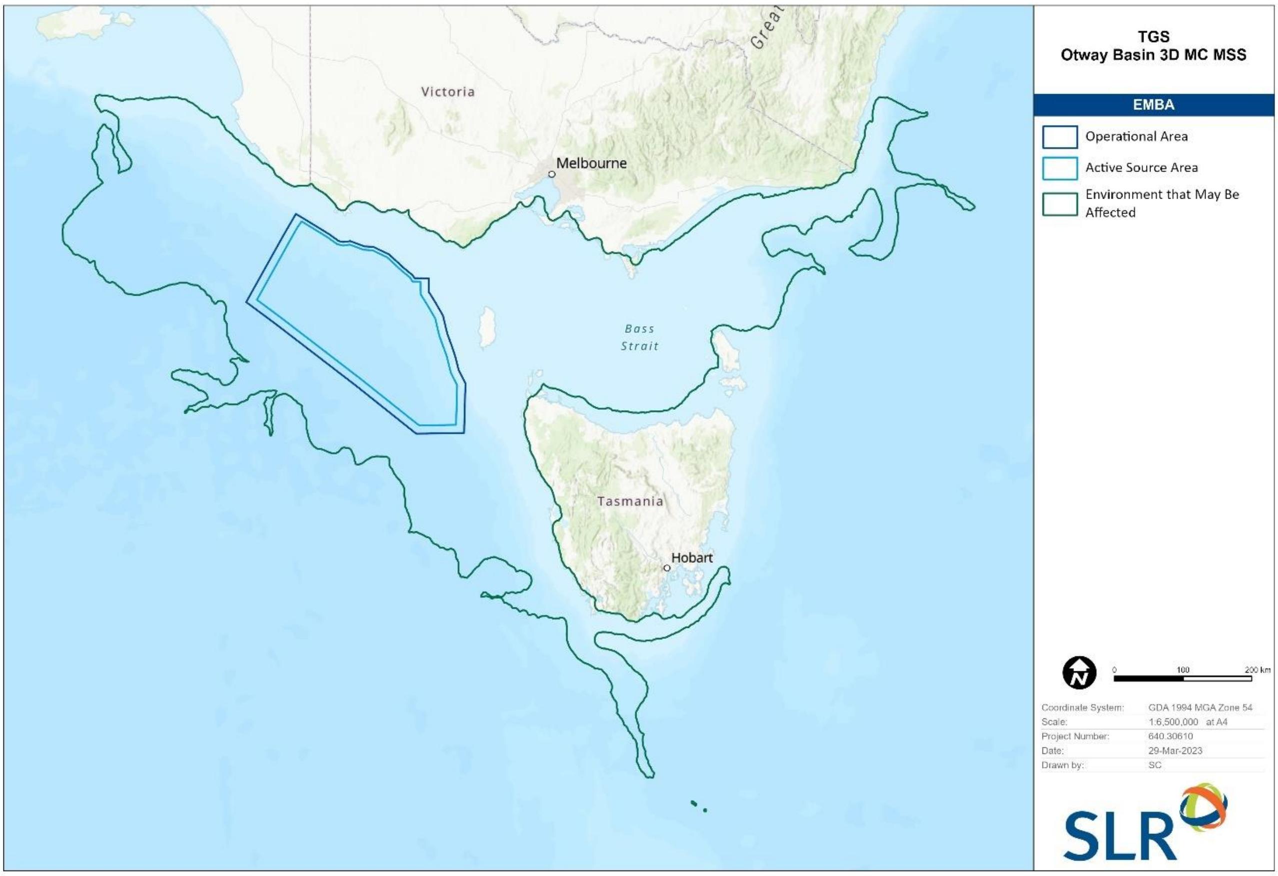


Figure 1 Location of Otway Basin 3D MSS and EMBA

1.3 Interface with other plans

This OSMP forms part of a wider emergency response framework, linking to the following emergency response documents:

- Survey or support vessel(s) >400 GRT SOPEP - deals with hydrocarbon spills which are either contained on the vessel or which can be dealt with from/by the vessel;
- Survey or support vessel(s) <400 GRT spill management plan - deals with spills which are either contained on the vessel or which can be dealt with from/responded by the vessel;
- The National Plan for Maritime Environmental Emergencies (National Plan) (AMSA, 2019);
- The VIC state plan: Transport Safety Victoria (**TSV**) (transport safety regulator for Victoria) Victorian State Emergency Management Plan (**SEMP**);
- The TAS state plan: Tasmanian Marine Oil and Chemical Spill Contingency Plan- TasPlan;
- The NSW state plan: NSW State Waters Marine Oil and Chemical Spill Contingency Plan, a sub-plan to the NSW State Emergency Management Plan; and
- The South Australian state plan: the South Australian Marine Spill Contingency Action Plan (**SAMSCAP**).

2 First response actions

2.1 Immediate Actions

Immediate actions for hydrocarbon releases from the Otway Basin MC MSS activity are defined in **Table 1.**

Table 1 Immediate Actions, Timeframes and Responsibilities for the Otway Basin 3D MC MSS in Response to a Hydrocarbon Release

Action	Timeframe	Responsibility
Identify the source of the hydrocarbon release and raise the alarm	Immediate; as soon as a release has been identified.	All offshore personnel
Activate the vessel shipboard oil pollution emergency plan (**SOPEP**)/spill management plan to stop the spill: • isolate the source of the spill • minimise the release volume (consider transfer of fuel from leaking tank) • clean up spill to deck	Following alarm being raised and rapid considerations of health and safety risks.	Vessel master (on-scene incident commander)
Classify the Level of the spill (see **Table 3**)	Immediately following activation of the SOPEP/OPEP	Vessel master
Verbally notify Australian Maritime Safety Authority (AMSA) via the AMSA Rescue Coordination Centre (**JRCC**) Australia on +61 (02) 6230 6811 (1800 641 792)	Immediately (as soon as possible) following alarm being raised	Vessel master
Notify TGS Seismic: Primary contact: [redacted] Secondary contacts: [redacted]	Immediately (as soon as possible) following alarm being raised	Vessel master

Action	Timeframe	Responsibility
[redacted]		
Activate TGS Incident Management Team (IMT)	Immediately, following verbal notification of release from vessel master	TGS IMT IC
Activate monitor and surveillance response strategy (see **Section 3.3**): • maintain visual observations • oil spill trajectory calculations	Within one hour of first report of spill	Vessel master, supported by TGS IMT
Undertake other relevant regulator notifications and reporting (see **Table 2**)	In a timely manner	Vessel master, supported by TGS IMT
Conduct a Net Environmental Benefit Assessment (NEBA) of spills response strategies and tactics	Within two hours of first report of spill	TGS IMT / AMSA
If wildlife is likely to be oiled, notify relevant jurisdictional control agency	Within two hours of identifying risk to oiled wildlife	TGS IMT / AMSA
For a Level 2 spill, activate Operational and Scientific Monitoring Plan (OSMP) and review activation triggers for individual monitoring plans	Within two hours of first report of the spill to the TGS on-call incident commander	TGS IMT / Control Agency(ies)

2.2 Notification requirements

Notification requirements for hydrocarbon releases from the Otway Basin 3D MC MSS activity are defined in **Table** 2. Oil spill incident levels are described in **Table 3**. In addition to the regulatory notification requirements listed below, identified Relevant Persons (as required) will be included in immediate and ongoing notification procedures (as outlined in Section 10.10.6.3 of the EP).

Table 2 Regulator Notification and Reporting Requirements

Organisation for notification	Responsible person	Contact details of organisation	Notification requirement and timeframe
Australian Maritime Safety Authority (AMSA)	Vessel Master	Verbal report: JRCC: +61 02 6230 6811; 1800 641 792	Verbal, ASAP
	Vessel Master	Email written report to rccaus@amsa.gov.au	Harmful substances report (**POLREP**) within two hours POLREP form is available in Appendix A and at https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)	TGS IMT	Verbal report (+61 08 6461 7090) followed up with written notification	*Any spill with the potential to cause moderate to significant harm.* Verbal report within two hours of the first report of the incident Written report within three days of the initial verbal report (which must also be cc'd to NOPTA[1] and DMIRS[2])
		Email written report to: submissions@nopsema.gov.au	Within three days Part 1 of Report of an Accident, Dangerous Occurrence or Environmental Incident (NOPSEMA form FM0831) https://www.nopsema.gov.au/assets/Freedom-of-information/F095/A543965.pdf
			Within 30 days

Organisation for notification	Responsible person	Contact details of organisation	Notification requirement and timeframe
			Part 2 of Report of an Accident, Dangerous Occurrence or Environmental Incident (NOPSEMA form FM0831) https://www.nopsema.gov.au/assets/Freedom-of-information/F095/A543965.pdf
Department of Agriculture, Water and the Environment (DAWE)	TGS IMT	Verbal: Compliance Hotline: 1800 110 395 (business hours only) Fauna: Phone: (02) 6274 1111	*Any spill with the potential to cause a significant impact to a matter of National Environmental Significance (NES) including impacts to protected species.* Verbal report within 48 hours of becoming aware of the incident or non-conformance.
		Email written report to: protected.species@environment.gov.au	Written report (no template). Follow incident-specific requirements.
Director of National Parks (DNP)	TGS IMT Incident Commander (**IC**)	Verbal report (+61 419 293 465)	As soon as practicable before hydrocarbon release exposure to areas managed by Director of National Parks (**DNP**) (including Mermaid Reef Marine Park, Argo-Rowley Terrace Marine Park)
Spill heading towards VIC Waters			
Transport Safety Victoria – Maritime Safety Victoria unit	TGS IMT IC	Verbal report: TSV-MSV unit 1800 223 022	Verbal notification as soon as it is identified that hydrocarbon may enter VIC State waters.
		Email written report to information@transportsafety.vic.gov.au	Marine Pollution Report (POLREP) within two hours. AMSA POLREP Form Template https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
			Marine Pollution Report (POLREP) within 24 hours. SITREP (AMSA template requirements)
VIC Department of Energy, Environment and Climate Action (DEECA)	TGS IMT IC	Verbally notify DEECA Duty Officer: 0419 597 010 if a spill is likely to contact areas managed by DEECA or if wildlife is oiled, followed by a written Marine Pollution Report (**POLREP**)	Verbal notification as soon as practicable before hydrocarbon release exposure to areas managed by DEECA. Witten notification as soon as practicably following the initial report
Spill heading towards TAS Waters			
TAS Environment Protection Authority	TGS IMT IC	Verbally notify TAS EPA Duty Officer: 1800 005 171 (03) 6165 4599 if a spill is likely to contact areas managed by EPA or if wildlife is oiled, followed by a written Marine Pollution Report (**POLREP**)	Verbal notification as soon as it is identified that hydrocarbon may enter TAS State waters.
		Email written report to incidentresponse@epa.tas.gov.au	Marine Pollution Report (POLREP) within two hours. AMSA POLREP Form Template https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
			Marine Pollution Report (POLREP) within 24 hours. SITREP (AMSA template requirements)
Spill heading towards SA Waters			
SA Department of	TGS IMT IC	Verbally notify SA DPTI Duty Officer: (08) 8248 3505	Verbal notification as soon as it is identified that hydrocarbon may enter SA State waters.

Organisation for notification	Responsible person	Contact details of organisation	Notification requirement and timeframe
Planning, Transport and Infrastructure		if a spill is likely to contact areas managed by DPTI or if wildlife is oiled, followed by a written Marine Pollution Report (**POLREP**)	
		Email written report to SA DPTI (via DIT) dit.marinesafety@sa.gov.au	Marine Pollution Report (POLREP) within two hours. AMSA POLREP Form Template https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
			Marine Pollution Report (POLREP) within 24 hours. SITREP (AMSA template requirements)
Spill heading towards NSW Waters			
NSW Department of Transport	TGS IMT IC	Verbally notify NSW DoT Duty Officer: (02) 8202 2200 if a spill is likely to contact areas managed by DoT or if wildlife is oiled, followed by a written Marine Pollution Report (POLREP)	Verbal notification as soon as it is identified that hydrocarbon may enter NSW State waters.
		Email written report to NSW DoTR (via NSW EPA) info@epa.nsw.gov.au	Marine Pollution Report (POLREP) within two hours. AMSA POLREP Form Template https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
			Marine Pollution Report (POLREP) within 24 hours. SITREP (AMSA template requirements)

[1] National Offshore Petroleum Titles Administrator (resources@nopta.gov.au)

2.3 Oil spill incident levels

As defined in the National Plan for Maritime Environmental Emergencies (AMSA, 2019) marine hydrocarbon spills are divided into three categories (termed 'Levels') (**Table 3**) depending on the volume released, the resources and capabilities required for an effective response, and to some extent the scale of environmental risk.

Table 3 Oil Spill Incident Levels

Aspect	Level 1	Level 2	Level 3*
Spill volume (m^3)	0-10	10-1,000	>1,000
Response period	Likely to be <48 hrs	48 hrs to weeks	Weeks to months
Description	Generally can be resolved through the application of local or initial response resources (first strike response).	Typically more complex in size, duration, resource management and risk than Level 1 incidents. May require escalated deployment of resources beyond the first strike response.	Characterised by a high degree of complexity, potentially with multiple hazards. Requiring strategic leadership and response coordination. May require national and international response resources.
Potential environmental impacts	Potential impacts are likely to be short-term, with recovery in days to weeks. A Level 1 release may be upgraded to a Level 2 release if there is a risk of significant environmental impacts.	Potential impacts are likely to be significant and with a more prolonged recovery period (weeks to months). A Level 2 release may be upgraded to a Level 3 release if there is a risk of significant environmental impacts.	Potential impacts are likely to be significant over large spatial scales with a prolonged recovery period (months to years). Remediation may be required.

*(Not considered credible for the Otway Basin 3D MSS).

3 Operational and Scientific Monitoring Plan

This section sets out the framework and requirements for developing an incident specific Operational and Scientific Monitoring Plan (**OSMP**). Development of the OSMP following an oil spill is based on the parameters of the spill, including the location, environmental conditions, fuel type, nature and scale of the spill, and any potentially impacted values including sensitive resources.

As part of the initial response, TGS and the Seismic Vessel operator will provide a first-strike response (i.e. local or initial resources to stop or contain spill) at the direction of the Control Agency and provide ongoing response and monitoring arrangements where requested.

Type I (Operational) and Type II (Scientific) monitoring plans may be implemented in the case of a Level 2 spill.

3.1 Type I – Operational Monitoring

As an integral part of the response to a spill 'Type 1', 'response phase' or 'operational monitoring', is used to collect information about the oil spill and associated response operations for the purposes of aiding decision-making during the response.

Type I 'Operational Monitoring' will be implemented where it is safe to do so and when there is a net benefit in doing so (as agreed with the Control Agency). This monitoring will be implemented to:

- Determine the extent and character of a spill;
- Visual tracking of the movement/ trajectory of surface slicks;
- Identify areas/ resources potentially affected by surface slicks; and
- Determine sea conditions/ other constraints.

Table 4 provides a description of operational and scientific monitoring plans (**OMP/SMP**) likely required in the event of a Level 2 spill (consistent with the worst-case scenario), the key receptors and the aims of the plan. These include:

- OMP1 (Oil Spill Modelling) - real-time spill trajectory modelling to provide assurances that response options can be tailored to the specific spill situation. The modelling will be based on continuous weather monitoring which will be utilised in conjunction with hindcast data to predict any potential beaching locations of the hydrocarbon, if any exist. This real-time spill trajectory modelling will be utilised to focus any potential scientific monitoring if it were to be required (and directed by the Control Agency) in order to monitor the impacts from a spill occurrence;
- OMP2 (Surveillance and Tracking) - field-based monitoring, including vessel and/or aerial surveillance, will be undertaken immediately following a spill event. This monitoring will enable the Vessel Master to provide up-to-date information to the relevant Control Agency via the POLREP form to appropriate plan any response options; and
- OMP3 (Monitoring of Hydrocarbons: Weathering and Behaviour in Marine Waters). This field-based monitoring will be led by an approved Service Provider.

Table 4 Monitoring Plans for the Otway Basin 3D MC MSS – Key Receptors, Aims and Responsibilities

Plan Reference	Title	Key Receptor(s)	Aim	Implementation
OMP1	Oil Spill Modelling	Multiple receptors at local- to regional-level scales	Provide information that can be used to define the spatial extent of the spill, for comparison with the pre-defined EMBA	TGS
OMP2	Surveillance and Tracking	Multiple receptors at local- to regional-level scales	Provide situational awareness to the Incident Management Team (**IMT**), to allow effective ongoing planning and management of spill response activities and identify any significant changes in risk Provide information to allow the assessment of the efficacy and potential impacts (positive and negative) of spill response strategies and tactics	TGS
OMP3	Monitoring of hydrocarbons in seawater - Weathering and Behaviour in Marine Waters	Offshore pelagic habitats (i.e., water column) exposed or at risk of exposure from spill hydrocarbons	Provide information that can be used to define the spatial extent of the spill, for comparison with the pre-defined EMBA, and inform SMP requirements	Service Provider
SMP1	Marine water quality	Background water quality	To monitor the hydrocarbons in marine waters to inform assessment of impacts and recovery of sensitive receptors, and to verify assumptions about any hindcast modelling to inform ongoing SMP requirements	Service Provider
SMP2	Intertidal and shoreline sediment quality	Background sediment quality, particularly focused on sensitive locations	Characterise the state, persistence and fate of spilled hydrocarbons within sediments	Service Provider
SMP3	Intertidal and shoreline habitats and benthos	Invertebrates, filter feeders, benthic primary producers, demersal fish, shorelines and intertidal habitats	Determine the impacts of spilled hydrocarbons on intertidal benthos and habitats	Service Provider
SMP4	Seabirds and shorebirds population and recovery	Foraging seabirds and coastal shorebird populations	Assess impacts on seabird and shorebird populations.	Service Provider
SMP5	Marine fauna (excluding avifauna)	Marine mammals, marine reptiles, bony fish, elasmobranchs	Assess impacts on non-avian marine fauna potentially impacted by a hydrocarbon spill.	Service Provider

Plan Reference	Title	Key Receptor(s)	Aim	Implementation
SMP6	Socio economic impact monitoring (fisheries, aquaculture and tourism)	Target species or areas of importance for fishing/tourism	Assess impacts on fisheries (including aquaculture) and tourism activities	Service Provider

This monitoring will enable the Vessel Master to provide the necessary information to the relevant Control Agency, via a POLREP form, to determine and plan appropriate response actions under the National Plan and the relevant State plan. Operational monitoring and observation in the event of a spill will inform an adaptive spill response and scientific monitoring of relevant key sensitive receptors.

Ongoing situational awareness information is provided to the Control Agency through the use of a Marine Pollution Situation Report.

TGS will assist with further operational monitoring (including funding if required) as directed by the Control Agency.

3.1.1 Operational monitoring: vessel surveillance

Vessel surveillance actions required following a spill are defined in **Table 5.**

Table 5 Vessel-Based Surveillance Requirements

Task	Responsible party
Request any available vessel in close proximity to monitor spill, including Otway Basin 3D MSS support vessels	Vessel Master/AMSA
Provide TGS IMT IC/AMSA information on spill, including spill trajectory, appearance and area of coverage.	Vessel Master/AMSA
Activate additional vessel surveillance support through AMSA.	AMSA
Termination criteria: Continue to monitor spill through vessel surveillance until: Slick is no longer visible Aerial surveillance has commenced.	AMSA

3.1.2 Operational monitoring: aerial surveillance

Aerial surveillance actions which may be activated by the CA are defined in **Table 6.**

Table 6 Aerial surveillance requirements

Task	Responsible party
Activate aerial surveillance support (aircraft and trained aerial observers) from AMSA	AMSA
Supply a copy of the Aerial Observer Log if required.	TGS IMT IC
Prepare and provide to the aviation contractor a pre-flight information pack containing: Safety considerations: • Identify and obtain the appropriate personal protective equipment (**PPE**), aviation lifejackets should be worn in aircraft • identify risks and necessary controls • Communicate the risks and controls in place through a pre-operation safety brief. Operational Communications Plan that documents: • Specific contacts and names of assets deployed • Methods of communication with personnel (including the crew of aircraft/vessels) • Call signs and radio communication frequencies.	AMSA
Conduct pre-flight briefing, which shall include: • Location of the area of operation • Radio frequencies used in the area and on the response • Call signs of other aircraft operating in the vicinity • Locations of any temporary or permanent exclusion zones.	AMSA
Use a global positioning system (GPS) to track aerial surveillance operations.	AMSA
Conduct localised search: • Use the predicted spill location as a starting point and conduct a localised search to determine the exact position of the spill • The aerial observer should sit directly behind the pilot, so the same perspective is shared, making it easier to direct the aircraft to the spill • Observers will have different perspectives. Ensure a comprehensive hand over brief is given to maintain consistency of approach	AMSA

Task	Responsible party
• Fly the length and width of the spill (noting time taken and speed) • Record and report observations of wildlife that are present in the area.	
Record aerial surveillance using: • Annotated maps or charts • Photographs (preferably geo-referenced) • Aerial surveillance logs.	AMSA
Undertake calculations (on the return journey or when the aircraft has landed): • Calculate distance of spill length or width: Distance of slick length or width (nm) = $\frac{\text{time taken to fly (seconds)} \times \text{speed (knots)}}{\text{3600 (or 60 if time taken to fly is in minutes)}}$ • Divide answer by 1.85 to convert to km • Calculate spill area: Spill area (km^2) = length (km) × width (km).	AMSA
Calculate spill volume: Use the Bonn Agreement Oil Appearance Code (**BAOAC**) to estimate the percentage spill coverage: • Divide the spill into percentage areas based on its appearance (e.g. 10% sheen, 40% rainbow and 50% metallic) • Use the following equation to calculate the minimum and maximum spill volume for each oil type: Maximum / minimum estimated spill volume (m^3) for each appearance type = area covered with specific appearance (%) × total area of spill (km^2) x thickness of slick (in µm) • Add together all the calculated volumes to calculate a total volume. • The Air Operations Branch Director may decide that International Tanker Owners Pollution Federation (**ITOPF**) oil observation guidance could be used by aerial observers instead of the BAOAC. ITOPF methods are in the Aerial Observation of Marine Oil Spills Technical Information Paper (ITOPF, 2011).	AMSA
Upon completion, provide the following: • Aerial surveillance logs • Location of oil identified (e.g. shown on a map or chart, waypoints on GPS or geo-referenced photo) • Quantity of oil observed and calculations • Other relevant information on the aerial surveillance operations (e.g. pilot operational hours, fuel logs, maintenance issues, logistical requirements, aerial simultaneous operations (SIMOPS) issues).	AMSA
Termination criteria: Continue routine aerial observations daily during daylight hours until no slick can be observed.	AMSA as the CA

3.1.3 Operational monitoring: spill trajectory assessment

3.1.3.1 Computer-based modelling (Level 2 only)

Oil spill trajectory modelling (OSTM) requirements are defined in **Table 7.**

Table 7 Computer-based oil spill trajectory modelling requirements

Task	Responsible party
Request oil spill trajectory modelling	AMSA
Termination criteria: Repeat modelling as required until the response is terminated by the control agency.	AMSA

If computer-based modelling is not yet available for a specific tractor assessment, then a manual trajectory calculation may be used (**Table 9**).

Table 8 Manual oil spill trajectory modelling requirements

Task	Responsible party
Request manual oil spill trajectory assessment	AMSA
Using vectors, draw the resulting distance of 3% of wind speed and 100% of current from the initial spill location for a 1-hour duration.	TGS IMT IC/AMSA
Repeat this process for each hour using the new location and predicted wind/current.	TGS IMT IC/AMSA (until OSTM data available)
Termination criteria: Level 1 – predictions completed for ≥12 hours Level 2 – Repeat manual calculations as required until computer modelling methods are available to provide the information required, or until the spill response phase has been terminated.	AMSA

3.2 Type II – Scientific Monitoring

'Type II', 'recovery phase' or 'scientific monitoring', comprises a series of Scientific Monitoring Plans (**SMPs**) designed to be implemented at the termination of the response phase to quantify impacts from the spill. In consultation with the Control Agency, TGS will commit to scientific monitoring dependent on the circumstances of the spill, and the sensitivities at risk.

3.2.1.1 Type II – Scientific Monitoring Services Agreement

Prior to the commencement of the Otway Basin 3D MC MSS, TGS will have in place an overarching service agreement with a service provider who have demonstrated capability to undertake Type II Monitoring. This agreement will ensure TGS has a capability to undertake Type II monitoring if required and also enable the service provider to act (in a capacity as agreed with all parties), to either assist the Control Agency or to undertake key Type II monitoring activities on TGS's behalf (if initiation criteria are triggered).

The service provider must demonstrate they have the following capabilities:

- Emergency manned mobile telephone number;
- Capacity to prioritise and deploy qualified personnel to execute each scientific monitoring plan (**Section 3.3**);

- Qualifications and capacity to prepare detailed supporting sampling analytical plans/ monitoring plans for each of the scientific monitoring plans described in **Section 3.3**;
- The ability to prioritise and mobilise resources to the region (i.e. logistics are in place); or resources are located within the region; and
- Capacity to mobilise personnel and resources to the region as soon as practicable.

A notification will be provided to the service provider within two hours of a known spill event, so the service provider can be ‘at the ready’, even in the event initiation criteria are not yet triggered.

3.2.1.2 Situational Awareness

In the event of a hydrocarbon spill, details that will be exchanged between TGS and the service provider describing situational awareness will include:

- Hydrocarbon type and size of spill;
- Is the spill under control;
- Potential environmental or external influences that may impact a monitoring response;
- Predicted behaviour and predicted trajectory of the spill;
- Potential sensitivities at risk;
- Any ongoing safety concerns; and
- Protection priorities.

3.3 Scientific Monitoring Plans

Following the initial notification of a spill, a NEBA will be undertaken in consultation with the Control Agency to identify applicable operational and scientific monitoring requirements. Where a net environmental benefit is identified and the Control Agency recommends field monitoring, the Service Provider will develop detailed OSMP plans. **Table 9** provides rationale for the various monitoring plans that would be developed.

Draft detailed monitoring plans will be provided to TGS as soon as practicable, but within 24 hours after receiving the initial notification that monitoring is required.

Detailed monitoring plans will be developed in consultation with the Control Agency and **TGS**. Each plan will include as a minimum:

- <u>Objectives and rationale of the monitoring plan:</u> Each plan developed will outline the key objectives, rationale and focus of the plan;
- <u>Baseline information</u>: It is important for each monitoring plan to specify the details of the baseline to be applied, or a method for selection of suitable reference/control sites. If possible, previous monitoring from published studies and findings is to be utilised;
- <u>Spatial awareness</u>: It is important for any scientific monitoring plan to provide information and outcomes obtained from the operational monitoring (such as real-time spill trajectory modelling) to support the proposed design;

- Methodology: The proposed survey methodology should consider the statistical methods and sampling effort required to achieve the objectives of the scientific monitoring plan. If sampling is proposed as part of the monitoring plan, industry recognised methods for collection and analysis of the samples must be used. This includes utilising accredited laboratories and following best practice guidelines and applicable legislation where applicable. The methodology should include, as a minimum:
  - Details of any permits or approvals required to undertake the work, including whether there are any exemptions;
  - Collection and analysis requirements (i.e. permits);
  - Personnel proposed to undertake the monitoring, including appropriate qualifications and skills;
  - Equipment required to complete the proposed monitoring;
  - HSSE requirements to complete the survey; and
  - QA/QC requirements if appropriate.
- Initiation criteria: The criteria used to initiate the proposed scientific monitoring plan;
- Termination criteria: Each monitoring plan will include a termination date at which time the monitoring can stop which is consistent with the objectives of the monitoring plan. These criteria must be adaptive and be able to change based on the actual circumstances of the impacts and/or risks of assessment;
- Management of change: The monitoring plans must be adaptive to ensure the impacts and risks are managed appropriately. As such, if a monitoring plan is required to change to adapt to these circumstances, then a process for change needs to be detailed so that any revision is provided to TGS and the relevant Control Agency for acceptance as soon as practicable. Any revisions undertaken must be tracked to clearly communicate the current status of the monitoring requirements; and
- Reporting: Each monitoring plan is required to detail the reporting of results during and post monitoring. This reporting will include ongoing situation reports during the implementation of monitoring; the timing of these situation reports will be based on the nature and scale of the impacts/risks. Post monitoring, a draft report and third-party peer reviewed report will be provided to TGS, the Control Agency and NOPSEMA which will include any recommendations resulting from the monitoring plan.

A number of monitoring plans may be required to monitor the potential impacts of a hydrocarbon spill.

Any monitoring plans that are implemented are required to be adaptive to allow key sensitivities at risk to be identified. Such as, if a Control Agency makes a reasonable request for monitoring to be undertaken on a receptor which isn't specified here, any service agreement will provide TGS with the capacity to react to these requests.

Table 9 Scientific Monitoring Plan Aims, Objectives and Rationale

Scientific Monitoring Plan	Key Receptor(s)	Aim	Objective	Rationale
SMP1: Marine water quality	Background water quality	To monitor the hydrocarbons in marine waters to support assessment of impacts and recovery of sensitivities and to verify hindcast modelling	Assess and document the extent and severity of hydrocarbon contamination utilising observations and/or in-water measurements made during operational monitoring. Provide data to inform further scientific monitoring plans.	Reductions in water quality are likely to result due to aromatic hydrocarbons being entrained within the water column. Subsequent partitioning, including to the water column, is expected. Impacts on the water quality from a hydrocarbon spill are important to understand and evaluate as this will potentially impact a range of other receptors, and data will be used to inform other monitoring plans described below.
SMP2: Intertidal and shoreline sediment quality	Background sediment quality, particularly focused on sensitive locations	Gain an understanding of the characteristics, persistence, and fate of spilled hydrocarbons within sediments exposed to beached oil	Estimate spilled hydrocarbon concentrations within sediment exposed to beached oil. Monitor changes over time in hydrocarbon concentrations. Provide data to assist assessment of impacts on benthic communities. Establish necessary response options.	Should a spill of hydrocarbons reach the shoreline it has the potential to impact on the sediment quality, and as such impact on intertidal biota (described below) which may be exposed to chronic toxicity levels of hydrocarbons.
SMP3: Intertidal and shoreline habitats and benthos	Invertebrates, filter feeders, benthic primary producers, demersal fish, shorelines and intertidal habitats	Determine the impacts of spilled hydrocarbons on intertidal benthos and habitats	Monitor impacts on intertidal and shoreline habitats from beached hydrocarbon contamination. Define recovery parameters for benthos. Monitor benthos recovery to hydrocarbon contamination. Establish necessary response options.	Shoreline habitats can be impacted from a spill through stranded floating hydrocarbons, or droplets entrained within the water column, with hydrocarbons becoming increasingly entrained within the nearshore waters. Aquatic organisms utilising these habitats can be exposed to elevated levels of hydrocarbons over their thresholds which will ultimately impact the organism.

Scientific Monitoring Plan	Key Receptor(s)	Aim	Objective	Rationale
SMP4: Seabirds and shorebirds population and recovery	Foraging seabirds and coastal shorebird populations	Assess impacts on seabird and shorebird populations.	Quantify foraging, nesting or breeding seabird and shorebird populations potentially impacted by spilled hydrocarbons. Quantify oiled avifauna, including mortalities. Establish necessary response options.	Seabirds and shorebirds can be impacted by hydrocarbons spills through the presence of hydrocarbons on the surface of the water and from hydrocarbons entrained within the water column. This can lead to potential behavioural, physiological and physical impacts such as deviation from migratory routes, disruption to their indigestion and/or coating their feathers resulting in the inability to fly.
SMP5: Marine fauna (excluding avifauna)	Marine mammals, marine reptiles, bony fish, elasmobranchs	Assess impacts on non-avian marine fauna potentially impacted by a hydrocarbon spill.	Quantify oiled marine fauna, including mortalities.	Hydrocarbon spills resulting in a surface slick or entrained within the water column has the potential for long-term impacts to marine fauna. Contact between marine fauna and a surface slick or in-water concentrations of hydrocarbon has the potential to elicit lethal and sub-lethal impacts, including behavioural (avoidance of foraging habitats or migratory routes), physiological (inability to digest) and/or physical effects.
SMP6: Socio economic impact monitoring (fisheries and tourism)	Target species or areas of importance for fishing/tourism	Assess impacts on fisheries (including aquaculture) and tourism activities	Monitor hydrocarbon concentration within tissue of species targeted by commercial fisheries. Identify potential impacts on human health as a result of hydrocarbon contamination. Assess recovery of tourism operations in area affected.	Commercial fishing operations for pelagic fish, prawn fisheries, shellfish can be impact from a hydrocarbon spill which can include lethal and sub-lethal physiological and physical effects. Any exposure to commercial and recreational target species can result in the tainting of flesh and increase in toxicity above human consumption thresholds. In terms of tourism, a hydrocarbon spill can result in a negative perception on the environment impacted by the spill.

3.3.1 Implementation of Scientific Monitoring Plans

The service provider will undertake all planning actions required to mobilise to the site. This will include providing a brief proposal to TGS which will outline the resources and personnel required, transport arrangements and timeframes for implementation. The service provider will undertake all reasonable measures to mobilise to the site as soon as practicable. The ability for the service provider to mobilise within 24 hours will be required under the service agreement.

Due to the low likelihood of a spill occurring, it is not considered reasonable to have these resources on standby during the Otway Basin 3D MC MSS. It would require considerable financial investments over and above the significant control measures implemented to reduce the risks of a vessel collision to **ALARP** and **Acceptable Levels**. Therefore, TGS consider the approach outlined above to be reasonably practicable based on the nature and scale of the risks associated with the Otway Basin 3D MC MSS.

3.4 Preparedness

This section includes information relating to contractual arrangements, communication protocols, roles and responsibilities and resources to activate the OSMP, initial mobilisation and ongoing maintenance of the response.

3.4.1 Contractual Arrangements

3.4.1.1 Approved Service Provider and TGS

TGS will have in place have a service agreement with an appropriately qualified and experienced scientific Service Provider. This overarching agreement will enable the approved Services Provider to initiate the planning and commence preparation in anticipation that a field response may be required.

3.4.1.2 Logistics

Logistical requirements (including but not limited to arrangement of transport, accommodation, victualling, shipping, vessels, etc.) will be contracted directly by TGS via existing overarching service agreements.

3.4.2 Roles and Responsibilities

Section 10.2 of the EP provides a description of the roles and responsibilities of all personnel involved in the Otway Basin 3D MC MSS. Those relevant to the OSMP implementation are described below.

3.4.2.1 OSMP Management

The roles responsible for the overall management of the OSMPs, and integration, data transfer and communications between TGS and the Service Provider are defined in **Table 10**.

Table 10 OSMP Management Roles and Responsibilities

Tile	Role	Responsibilities
TGS Project Manager (**PM**)	- The TGS PM is the direct line of communication and Management between and the OSMP Service Provider - The role facilitates information transfer between TGS internal management and stakeholders and Service Provider, manages the day-today needs of the project (including addressing operational needs/requests), and makes sure that the OSMP meets the needs of TGS (including regulatory requirements) and external independent review/stakeholder groups	- Has overall responsibility for the implementation of the OSMP. - Ensures all required reporting (including to regulators and AMSA) has occurred in accordance with the relevant requirements. - Notifies Service Provider in the event of a Level 2 spill within two hours and provide the relevant information discussed in Section 10.9.5.3 in the EP. - Coordinates communication/liaison between the Service Provider, AMSA, TGS and any other relevant parties. - Provides and/or facilitates support to the OSMP service provider (e.g. in the application of permits).
Service Provider Project Manager	- Direct engagement with the TGS PM. - Responsible for the implementation and day-to-day management of the OSMPs, and information transfer between TGS and the OSMP response teams. - Management of communications between the OSMP Service Provider and TGS.	- First point of contact in the event that an OSMP response is required. - Response initiation. - Management of the Service Provider personnel and subcontractors. - Day-to-day responsibility for facilitating/coordinating OSMP monitoring activities. - Direct engagement with the TGS PM. - Maintenance of the Service Provider's preparedness - Overall responsibility for HSE of the Service Provider's personnel and subcontractors.
TGS Onboard Representative	- Direct engagement with the Service Provider Monitoring Coordinator.	- Day-to-day responsibility for the provision of the spill characteristics and operational monitoring required to implement the OSMP. - Day-to-day responsibility for facilitating/coordinating OSMP monitoring activities on behalf of TGS.
Service Provider Monitoring Coordinator	- Direct engagement with the Service Provider Monitoring Coordinator. - Oversight of the Field Operations Coordinator (see **Table 11**).	- Responsible for the development of detailed OSMP plans and their implementation. - Responsibility for overseeing an OSMP is initiated and performed.

3.4.2.2 Operational Management Personnel

The roles responsible for the day-to-day management of survey operations and operational activities (including data management, QA/QC and reporting) are outlined in **Table 11**.

Table 11 Operational Personnel Roles and Responsibilities

Tile	Role	Responsibilities
Service Provider Field Operations Coordinator	- Supporting the mobilisation and the day-to-day field management of OSMPs. They are required to engage with the internal management team and TGS logistics (in line with the communications protocol) to resource, equip and maintain all survey operations	- Day-to-day management of field teams - Engagement with subcontractors and analytical laboratories - Sourcing personnel, equipment and consumables for OSMPs, including managing shifts and periodic shift rotations - Coordinating logistics with TGS (equipment, sample containers, travel and accommodation, supporting infrastructure, etc.) - Managing relevant survey permit applications and notifications - Coordinating sample pick-up and shipping to labs in line with sample holding times - Arranging sample labels (e.g. barcodes) with laboratory - First point of contact for field teams - Management of personnel qualification, medical and accreditation database - Communicating survey platform requirements (e.g. winches, a-frames, deck cranes, deck space, etc.) - Identification of additional survey requirements
HSE Coordinator	- Health, safety and environment (**HSE**) aspects of the OSMP scope	- Management of all HSE related plans - Point of contact for Health, Safety and Environment issues - Provision of guidance in all HSE matters - Management of HSE reviews, incident investigation and reporting - Management of post-survey debriefs and lessons learned as part of an ongoing improvement process - Review of load testing information for equipment and additional components

Tile	Role	Responsibilities
Data Manager/ Quality Lead	- Managing the collection, transmittal, QA/QC and delivery of all OSMP and laboratory data. Responsible for ensuring all QA/QC procedures are in place and that processes have been adhered to	- Management of the preparation and implementation of Standard Operating Procedures in line with appropriate guidance and standards - Management of QA/QC reviews - Development and implementation of the data and metadata management plan - Provision of data management and QA/QC guidance throughout the OSMP response - Responsible for managing data quality (QA/QC), issues and lessons learned
Field Technical Leads	- Technical quality of survey operations, data and sample collection in the field - Responsible for all non-vessel-based survey management (e.g. HSE, field communications, field operational management decisions)	- Supporting mobilisation and demobilisation of equipment - Participating in HSE processes (e.g. HSE briefings, toolbox talks) - Coordinating day-to-day survey planning with the Vessel Party Chief and/or other Field technical leads (where appropriate) - Pre-survey vessel contamination risk assessment (to plan deck operations to minimise vessel-related sample contamination risks) - Field management of technical survey protocols, equipment, personnel and subcontractors - Deployment and retrieval of survey equipment - In situ collection of samples in line with approved SAP/PEP procedures - QA/QC of samples and sampling procedures - In situ identification of biota (where required) - Collection of relevant environmental meta data (e.g. time, sampling coordinates, depth, conditions etc.) - Management of sampling data records (e.g. field sheets, data records) and imagery - Sample processing and proper handling and storage - Sample transfer and Chain of Custody (**CoC**) forms - All field personnel have stop work authority – safety is everyone's responsibility

Tile	Role	Responsibilities
Field Survey Personnel (Field Teams)	- Collection of data and samples under the direction of the field technical lead	- Supporting mobilisation and demobilisation of equipment - Participating in HSE processes (e.g. HSE briefings, toolbox talks) - Deployment and retrieval of survey equipment - Labelling of sample containers - In situ collection of samples in line with approved SAP/PEP procedures - Sample processing and proper storage - Data entry - Sample transfer and CoC forms - All field personnel have stop work authority – safety is everyone's responsibility

3.4.3 Communication

All OSMP response communications will be managed by the TGS Project Manager (**PM**) in accordance with the OPEP.

3.4.4 Resources and Quality Control

Resource suppliers / service providers will be required to demonstrate capabilities/competencies across TGS's Contractor Management SOPs and as relevant across their selected areas of expertise as follows:

- Demonstrable personnel competencies and capabilities for area of expertise to implement each OMP and SMP:
  - Appropriate accreditation, qualifications and experience, reliability
- Field personnel safety and security training and accreditation and HSE management, including Senior First Aid certification, Hazard Identification, Job Hazard Analysis, HSE planning and risk management
- Relevant offshore health and safety training accreditation, including:
  - Medical (e.g. United Kingdom Oil and Gas (**UKOG**) offshore medical, or equivalent);
  - Maritime Security Identification Card (**MSIC**); and
  - Basic Offshore Safety Induction and Emergency Training (**BOSIET**) or Tropical Basic Offshore Safety Induction and Emergency Training (**TBOSIET**).

In addition, assessment of capability and competencies will be inclusive of Service Provider ability to demonstrate Standard Operating Procedures (**SOPs**) for QA/QC (such as ISO 9000 across all aspects for implementing OMP and SMPs, including field record data management and field data QA/QC, any report related data management QA/QC procedures.

3.4.5 Health, Safety and Environment

3.4.5.1 HSE management

HSE performance will be managed through TGS's QHSE SOPs. This process requires contractors to meet TGS's QHSE SOPs requirements via compliance checks and requires all contracted companies to have an HSE management system in place that demonstrate the process by which health and safety is managed within the organisation.

3.4.5.2 HSE Plan and provisions

The Service Provider will identify senior HSE personnel who are available to provide rapid response capability during an oil spill emergency. These contact details will be provided to TGS.

Comprehensive QHSE Plan(s) for OSMP activities will be developed prior to mobilisation addressing any risks associated with working in a hydrocarbon spill area. Such risks include the potential exposure of operational personnel to hazardous hydrocarbon compounds (e.g. volatile organic compounds, and management actions such as safe work limits will be defined based on recommendations in the TGS HSE plan.

The QHSE plans are inclusive of appended standard Job Hazard Analyses plans, and identification of and components in the SMPs that may require specific MSDS to be appended (in the case where SMPs may require the use of chemicals for cleaning and/or storage/preservation of samples taken during the implementation of a SMP). HSE plans will also include all relevant personal protective equipment (**PPE**) requirements and will include any specialised PPE relevant for offshore HSE operations.

3.4.6 Permit Requirements

OSMP field survey operations may be undertaken in both Commonwealth and state waters (the latter extend from the mean low water mark to the three-nautical mile limit) and a hydrocarbon release could conceivably reach the mainland and nearshore island waters (which are determined based on modelling outcomes and to be verified through surveillance during the event of a spill). The permits generally required by the Commonwealth are listed in **Table 12**. State based permits may be required, and are location specific.

In general, permit applications require details on the samples to be collected (including timing, species, numbers, methods to be used, etc.) and specific details of the survey platforms (e.g. vessel names and registration details) and personnel. Permits can take 4–6 weeks (or longer) to be approved, though in the event of an oil spill, the Responsible Agencies can expedite the process and/or possibly offer exemptions (depending on the legal ramifications to the relevant agency).

Notification SHALL be given to relevant government agencies in the region to be sampled, prior to mobilisation. Post-survey reports must also be filed in accordance with the requirements of the specific permit(s) in place.

Confirmation of any reporting requirements shall be sought should an exemption be granted.

Table 12 Commonwealth permit requirements for the collection of survey samples

Permit	Relevance	Legislation	Responsible Agency
Commonwealth			
General Permit Application for: threatened species and ecological communities migratory species whales and dolphins listed marine species.	Required for scientific sampling of matters listed under the Environment Protection and Biodiversity Conservation Act 1999 (**EPBC Act, 1999**)	EPBC Act 1999	Department of the Environment and Energy (**DEE**)
Access to Biological Resources in a Commonwealth Area for Non-Commercial Purposes	An applicant must obtain written permission from each Access Provider. The Access Provider must state permission for the applicant to: enter the Commonwealth area take samples from the biological resources of the area remove samples from the area.		

3.5 Initiation and termination of the OSMP

Initiation and termination criteria for the OSMP are defined below.

3.5.1 Initiation Criteria

Initiation criteria for the Type 1 Operational and Type II Scientific monitoring tasks are shown in **Table 13**. In the case of a Level 2 spill, AMSA would likely request trajectory modelling indicates that sensitive receptors may be impacted in consultation with AMSA, a Net Environmental Benefits Assessment will be performed to help identify the most appropriate studies to initiate.

Once the extent of the spill and required response effort is understood, the Service Provider and the TGS Project Manager will agree any additional costs, time and resources required to implement the appropriate elements of the OSMP. As soon as possible after notification (but within 12 hours), a teleconference will be held between the Service Provider and TGS project managers, the responsible program and response managers, the vessel operator and vessel master (or representative if unavailable) to determine requirements for scientific monitoring. The Monitoring Coordinator(s) will then begin coordinating the development of the detailed monitoring plans.

An overview of the response process, through the mobilisation of personnel and equipment is provided in **Figure 2**. Termination criteria and provided in **Section 4** (**Table 15**).

Table 13 Initiation Criteria - Operational and Scientific Monitoring Plan

Plan	Criteria
OM1 - Oil spill modelling	Notification of a Level 2 or greater hydrocarbon spill

Plan	Criteria
OM2 – Surveillance and tracking	Notification of a Level 2 or greater hydrocarbon spill
OM3 - Monitoring of hydrocarbons in seawater	Notification of a Level 2 or greater hydrocarbon spill
SMP1 - Marine water quality	Notification of a Level 2 or greater hydrocarbon spill
SMP2 - Intertidal and shoreline sediment quality	Notification of a Level 2 or greater hydrocarbon spill and Where modelling and/or Operational Monitoring indicates likely exposure to intertidal and/or shoreline sediments or Reports are received of shoreline and/or shoreline contact from hydrocarbon spill
SMP3 - Intertidal and shoreline habitats and benthos	Notification of a Level 2 or greater hydrocarbon spill and Where modelling and/or Operational Monitoring indicates likely exposure to intertidal and/or shoreline habitats or benthos, or Reports are received of shoreline and/or shoreline contact from hydrocarbon spill
SMP4 - Seabirds and shorebirds population and recovery	Notification of a Level 2 or greater hydrocarbon spill and Where modelling and/or Operational Monitoring indicates likely exposure to seabird and/or shorebird populations and/or Reports are received of contact with avifauna from hydrocarbon spill And/or Reports of oiled or dead avifauna are received
SMP5 - Marine fauna (excluding avifauna)	Notification of a Level 2 or greater hydrocarbon spill and Where modelling and/or Operational Monitoring indicates likely exposure to non-avian marine fauna and/or Reports are received of contact with non-avian marine fauna from hydrocarbon spill and/or Reports of oiled or dead non-avian marine fauna are received
SMP6 - Socio economic impact monitoring (fisheries, aquaculture and tourism)	Notification of a Level 2 or greater hydrocarbon spill and Where modelling and/or Operational Monitoring indicates likely exposure to aquaculture operations and/or Reports are received of commercial fisheries closures due to hydrocarbon contamination and/or Reports are received of tourism operation closures due to hydrocarbon contamination.

The initiation criteria (**Table 13**) for each monitoring plan is broadly applied to enact the response described within the EP. However, it is important to note that the final decision to commence each monitoring plan will be based on the net environmental benefit in which the environmental sensitivities should be avoided if the monitoring proposed may reasonably result in further impacts and offer no net benefit.

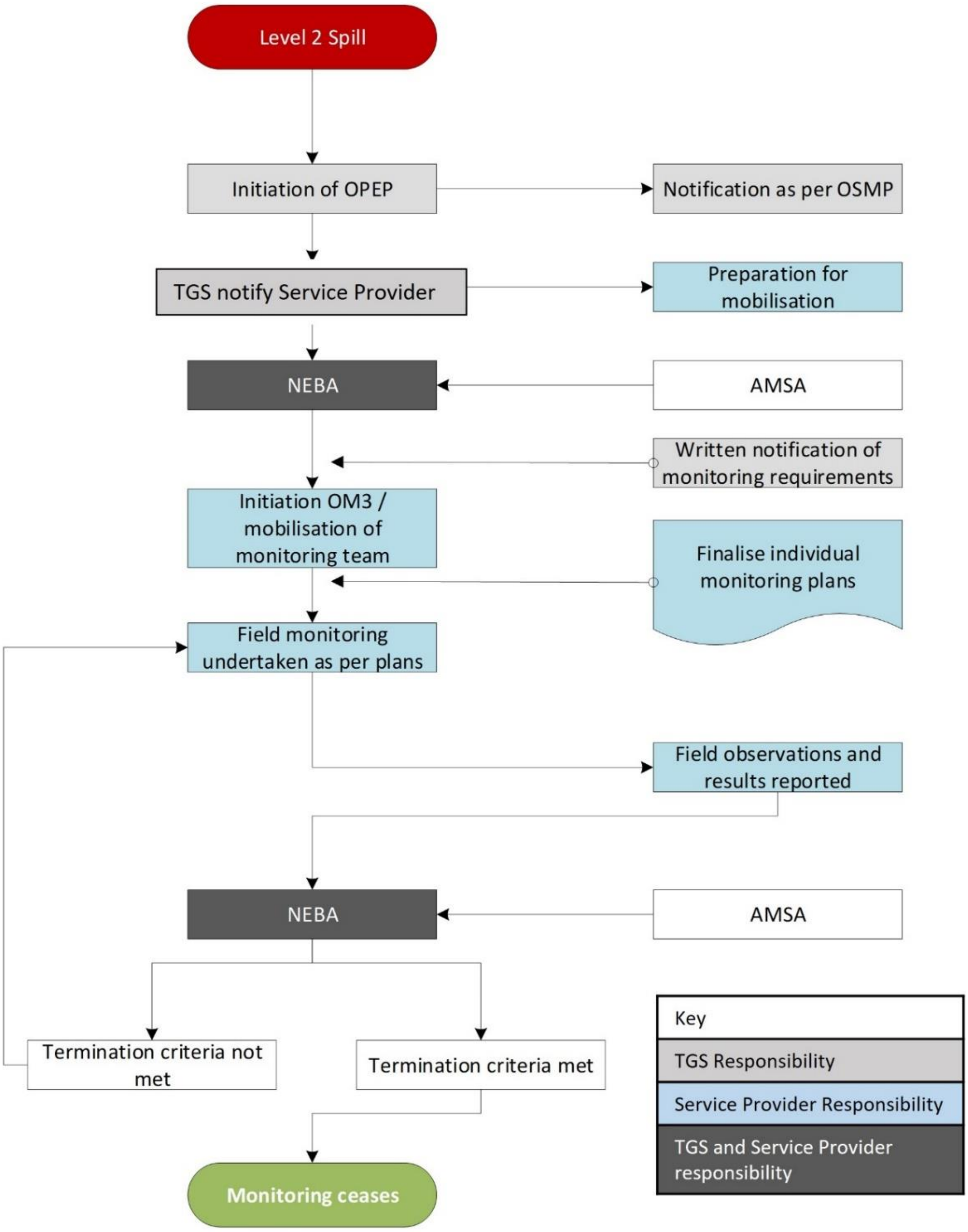


Figure 2 OSMP Implementation Process

3.5.1.1 Oiled wildlife response (OWR)

Wildlife protection and response operations will be directed by AMSA in Commonwealth waters.

The Western Australian Oiled Wildlife Response Plan for a Maritime Environmental Emergency is administered by the DBCA. During a Maritime Environmental Emergency, DBCA will lead the oiled wildlife response under the control of the appointed CA. Alternatively the CA may engage AMOSC to support/direct oiled wildlife response.

TGS will provide support to the CA and DBCA/AMOSC for the duration of the response. TGS will not undertake any oiled life response unless directed by the CA. **Table 14** provides the process which would be undertaken in the event of wildlife response.

Table 14 Oiled Wildlife Response Requirements

Task	Responsible party
Notify the relevant agency when injured/oiled wildlife is confirmed or could potentially occur. Notifications of oiled wildlife will be undertaken by relevant control agency(ies)	CA supported by TGS IMT IC
Obtain any licences required from the relevant state wildlife licensing authority, at the time of any incident and prior to undertaking any exclusion, hazing or fauna handling activities such as pre-emptive capture.	Relevant CA IMT(s)
Provide additional support to control agency/ies as directed by AMSA	TGS IMT IC
Activate the relevant scientific monitoring program depending on species impacted, in consultation with AMSA.	TGS IMT IC
Termination criteria: Continue supporting the control agency in oiled wildlife response until: injured/oiled wildlife have all been treated or euthanised dead wildlife and waste have been disposed of control agency(ies) have terminated the response phase in line with their relevant plans.	Relevant CA IMT(s)

3.5.2 Termination Criteria

Each monitoring plan that is initiated will continue until certain termination criteria have been met (**Table 15**), in consultation with the relevant Control Agency (**AMSA**).

TGS will appoint an investigation team following the termination of a spill response. The investigation team will be responsible for:

- Undertaking an investigation into the cause of the spill. Feedback will be sought from stakeholders as part of the investigation and evaluation of response success;
- Organising an after-action review of both the emergency and spill response actions;
- Close-out of all TGS IMT and emergency response actions;
- Implementation of a lessons learned assessment process, which will form the basis of a post-incident action plan; and
- Liaison with all involved external agencies to support their post-incident investigations and close-out activities.

Table 15 Termination criteria

Plan	Criteria
OMP1 - Oil Spill Modelling	It can be demonstrated that no further environmental improvement outcomes can be achieved through continued implementation of OMP1 and/or Notification of termination of spill response phase.
OMP2 - Surveillance and Tracking	It can be demonstrated that no further environmental improvement outcomes can be achieved through continued implementation of OMP2 and/or Notification of termination of spill response phase.
OMP3 - Monitoring of hydrocarbons in seawater	It can be demonstrated that no further environmental improvement outcomes can be achieved through continued implementation of OM3 and/or Notification of termination of spill response phase.
SMP1 - Marine water quality	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Monitoring data of in-water concentrations of hydrocarbons have been compiled and analysed. Reporting on sampling has been completed detailing extent and severity of spilled hydrocarbons which can enable further analysis of impacts on other receptors in any further scientific monitoring plans.
SMP2 - Intertidal and shoreline sediment quality	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Any monitoring done shows concentrations of hydrocarbons present within sediments fall below relevant guidelines (e.g. ANZG). Reporting on the sampling has been completed detailing the extent and severity of spilled hydrocarbons which can enable further analysis of impacts on benthic communities.
SMP3 - Intertidal and shoreline habitats and benthos	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Impacts from hydrocarbon spill on benthos quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on benthos.
SMP4 - Seabirds and shorebirds population and recovery	Hydrocarbon spill has ceased, are no visible sheens present and no further sheens are predicted by the modelling. Objectives and values associated with any relevant species recovery plans and/or conservation advice have been met. Impacts from hydrocarbon spill on avifauna quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on avifauna.
SMP5 - Marine fauna (excluding avifauna)	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Objectives and values associated with any relevant species recovery plans and/or conservation advice have been met. Impacts from hydrocarbon spill on marine fauna (excluding avifauna) quantified and recovery evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on marine fauna (excluding avifauna)
SMP6 - Socio economic impact monitoring (fisheries, aquaculture and tourism)	Hydrocarbon spill has ceased, there are no visible sheens present and no further sheens are predicted by the modelling. Impacts to important commercial fisheries quantified and recovery evaluated. Impacts to seafood quality and secondary impacts on human health evaluated. Impacts on tourism ventures quantified and evaluated. Reporting on the monitoring has been completed detailing the extent and severity of spilled hydrocarbon impacts on commercial fisheries, aquaculture and tourism operations.

3.6 Development of Detailed Monitoring Plans

Following the initial notification of a spill, a NEBA will be undertaken in consultation with the Control Agency to identify applicable operational and scientific monitoring requirements. Where a net environmental benefit is identified and the Control Agency recommends field monitoring, the Service Provider will develop detailed OSMP plans in accordance with the EP.

Draft detailed monitoring plans will be provided to TGS as soon as practicable, but within 24 hours after receiving the initial notification that monitoring is required.

Detailed monitoring plans will be developed in consultation with the Control Agency and TGS. Each plan will include as a minimum:

- Objectives and rationale of the monitoring plan: Each plan developed will outline the key objectives, rationale and focus of the plan.
- Baseline information: It is important for each monitoring plan to specify the details of the baseline to be applied, or a method for selection of suitable reference/control sites. If possible, previous monitoring from published studies and findings is to be utilised.
- Spatial awareness: It is important for any scientific monitoring plan to provide information and outcomes obtained from the operational monitoring (such as real-time spill trajectory modelling) to support the proposed design.
- Methodology: The proposed survey methodology should consider the statistical methods and sampling effort required to achieve the objectives of the scientific monitoring plan. If sampling is proposed as part of the monitoring plan, industry recognised methods for collection and analysis of the samples must be used. This includes utilising accredited laboratories and following best practice guidelines and applicable legislation where applicable. The methodology should include, as a minimum:
  - Details of any permits or approvals required to undertake the work, including whether there are any exemptions;
  - Collection and analysis requirements (i.e. permits);
  - Personnel proposed to undertake the monitoring, including appropriate qualifications and skills;
  - Equipment required to complete the proposed monitoring;
  - HSSE requirements to complete the survey; and
  - QA/QC requirements if appropriate.
- Initiation criteria: The criteria used to initiate the proposed scientific monitoring plan.
- Termination criteria: Each monitoring plan will include a termination date at which time the monitoring can stop which is consistent with the objectives of the monitoring plan. These criteria must be adaptive and be able to change based on the actual circumstances of the impacts and/or risks of assessment.
- Management of change: The monitoring plans must be adaptive to ensure the impacts and risks are managed appropriately. As such, if a monitoring plan is required to change to adapt to these circumstances, then a process for change needs to be detailed so that any revision is provided to TGS and the relevant Control Agency for acceptance as soon as practicable. Any revisions undertaken must be tracked to clearly communicate the current status of the monitoring requirements.

- Reporting: Each monitoring plan is required to detail the reporting of results during and post monitoring. This reporting will include ongoing situation reports during the implementation of monitoring; the timing of these situation reports will be based on the nature and scale of the impacts/risks. Post monitoring, a draft report and third-party peer reviewed report will be provided to TGS, the Control Agency and NOPSEMA which will include any recommendations resulting from the monitoring plan.

3.7 Activation and Initial Mobilisation

3.7.1 Immediate Response

1. Following notification of a Level 2 spill by the TGS Project Manager, the Service Provider Program Manager will confirm availability of scientific personnel and instruct each team member to stand-by.
2. Incident control will be established at the Port Hedland Supply Base, Western Australia.
3. Equipment will be prepared for shipping and laboratories and freight contractors placed 'on-call'. Flights and accommodation will be booked. Vessel operators will be contacted and advised to prepare for mobilisation. The analytical laboratory will prepare and dispatch all sample containers. Security arrangements for sample handling and transport will be confirmed with both laboratory personnel and the courier company.
4. Inductions under the Service Provider HSE Management System will be conducted prior to any site / field work. Any additional HSE inductions required by TGS will also be completed at this time.

3.7.2 Mobilisation

3.7.2.1 Freight

TGS will be responsible for logistical management of freight during the response phase.

Shipping of equipment will be managed by the Service Provider during the scientific monitoring phase and will have in place an overarching service agreement with a current national freight carrier. This will include the ability to transport any samples (e.g. in a chilled / refrigerated state) to arrive within laboratory specifications. under

Sample transfer is described separately in **Section 3.7.4.**

3.7.2.2 Personnel

Personnel mobilised for scientific studies may require accommodation. This will be managed by TGS. Where TGS direct the Service Provider to arrange accommodation (e.g. to support scientific monitoring), the Service Provider administration team will source and book accommodation as per instructions from the Service Provider Program Manager.

It is anticipated that all personnel will arrive at Port Melbourne (VIC), Warbambol (VIC) or Port of Devonport (TAS) within 24 hours.

3.7.3 Daily Field Reporting

All field teams will prepare daily progress reports for transmittal to the Service Provider Field Operations Coordinator. The daily progress reports will address project and scope details of the relevant component of the OSMP, including but not limited to:

- OSMP specifications (OMP / SMP implementation, permits required, anticipated resource requirements);
- Daily field/sea/ weather conditions;
- QHSE updates;
- Equipment and vessel updates;
- Key activities during the day and relevant details/outcomes; and
- Outlook for planned activities (next day and beyond).

3.7.4 Sample Transfer and management

Samples collected for laboratory analysis as part of OSMP field operations will be stored and transferred as per the specific instructions provided by the analytical laboratory for each analytical method. Samples will be collated based on holding times, storage requirements and sample type, to maximise sample management and facilitate transfer of samples within holding times.

All samples submitted for analysis will be accompanied by a detailed and completed Chain of Custody form, which details the laboratory the samples will be sent to, and all analytical requirements.

Where holding times are shorter than the survey rotation period (e.g. seven days for water samples, with up to three weeks between survey personnel rotations), then alternative arrangements will be made to collect samples for transfer to the laboratory. Samples will either be freighted from site/ports to laboratories or accompany survey personnel on return flights for hand-delivery to laboratories. Refrigerated transport or samples packed in ice-packed eskies will be required for the majority of samples.

3.7.5 Data Transfer and Management

All data management protocols (including related equipment checks, data security, data QA/QC, data storage and management), as well as field-based QA/QC protocols will be in place by the Service Provider prior to the commencement of the Otway Basin 3D MC MSS.

Laboratory data will be received by the Service Provider approximately two weeks following receipt of the samples by the analytical laboratory. The Service Provider will undertake a QA/QC review of laboratory reports and collate relevant data (including metadata) into files for subsequent analysis.

3.8 Reporting and Closeout

Upon termination and demobilisation of the final active OSMP, the operational and scientific monitoring program finalisation and close-out phase will commence. This phase incorporates:

- Data collation and delivery;
- Analysis and interpretation;

- Final reporting; and
- Archiving.

3.8.1 Data Collation and Delivery

QA/QC'd data will be compiled in OSMP databases throughout the OSMP response. Data collation includes digital (scanned) copies of all field survey reports, field survey logbooks, CoCs and other records completed by hand.

The Data Manager/Quality Lead will ensure the compiled datasets have been checked against data records to confirm that all data (and metadata) for each scope are accounted for and will confirm details of the QA/QC assessments undertaken on the data. Any remaining data gaps will be identified and addressed, with records generated detailing the outcomes.

Once all digital data (or sets of data) have been compiled and final checks have been completed, databases will either be transferred to TGS via appropriate password-protected storage media, or (where applicable and in line with corporate data management requirements) transferred via online resources (e.g. secure websites/data portals, cloud services and/or Corporate internet-based file transfer systems).

3.8.2 Analysis and Interpretation

Final datasets for individual scopes (SMPs) will be analysed to provide interpretation of:

- Impacts of the spill on the values or sensitivities for each plan;
- Potential impacts of spill response activities;
- Recovery over time; and
- Consideration of the potential effects of other natural and anthropogenic impacts.

Statistical analyses of quantitative data will be undertaken using appropriate, commonly used and scientifically-robust univariate and multivariate statistical analysis techniques. Depending on the size of datasets for each scope, data analyses may be undertaken solely by the Service Provider or in conjunction with a third-party service provider.

3.8.3 Final Reporting

Reporting will comprise:

- OSMP program status reports;
- Field daily progress reports;
- Health, safety and environment (HSE) reports;
- Technical reports;
- A summary report, collating the outcomes of each OSMP report; and
- A 'lessons learned' report, detailing OSMP challenges, solutions and future recommendations.

3.8.4 Archiving and Close-out

All digital and paper records, data and reports will be archived in accordance with the Service Provider's internal archiving procedures and standards. Completion of the archiving process will be the final requirement of the operational and scientific monitoring program close-out phase. TGS will then be informed that the OSMP response has been completed.

3.9 OPEP Review and Revision

In accordance with subregulation 14(8) of the Environment Regulations, the OPEP will be reviewed, updated and resubmitted to NOPSEMA should a change to the existing OPEP be required. It is considered, such changes to the OPEP could arise due to:

- A change to the EP that may impact spill response capabilities or coordination, such as an increase to the potential risk of a spill or release of hydrocarbons;
- When a significant change to the activities currently included within this EP has occurred, which could have implications on spill response or coordination;
- During routine testing of the OPEP, where improvements or corrections of the current OPEP are identified; and
- Any learnings from the result of a Level 1 or Level 2 spill or incident.

Any changes made to the OPEP, and any subsequent resubmission will be informed by the Environment Regulations or any other relevant Commonwealth regulations. If a change to the OPEP is required, TGS will undertake this in accordance with the Management of Change (**MoC**) procedures.

The TGS Project Manager will be responsible for the OPEP and ensuing that any relevant updates are made to the OPEP, and should any amendments be required, that the revised plan is submitted to NOPSEMA.

ASIA PACIFIC OFFICES

ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS
Level 1, Suite 1.06
Boland's Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
1/25 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Level 1, 500 Hay Street
Subiaco WA 6008
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SUNSHINE COAST
Suite 2, 14-20 Aerodrome Rd
Maroochydore QLD 4558
Australia
T: +61 7 3858 4800

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
201 Victoria Street West
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203

ASIA PACIFIC OFFICES

ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS
Level 1 Suite 1.06
Boland's Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203